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UNITED STATES
DEPARTMENT OF THE INTERIOR
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BUREAU OF MINES
R. R. SAYERS, DIRECTOR

INFORMATION CIRCULAR

GEOPHYSICAL ABSTRACTS 113

APRIL-JUNE 1943

COMPILED BY

W. AYVAZOGLOU AND V. SKITSKY

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UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

GEOPHYSICAL ABSTRACTS 113, APRIL - JUNE 1943 1/

Compiled by W. Ayvazoglou 2/ and V. Skitsky 3/

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1. GRAVITATIONAL METHODS

6889. Aslakson, C. I., and Swick, C. H. Gravity Observations in Peru and Colombia. Coast and Geodetic Survey, Special Pub. 233, U. S. Government Printing Office, Washington, D. C., 1943, 18 pp. (Price, 10 cents.)

In accordance with the policy of cooperation among American republics, the United States Coast and Geodetic Survey in 1941 made gravity surveys in Peru and Colombia. The information was desirable for determining the figure of the earth for geophysical purposes and for studying the relationship between intensities of gravity and deflections of the vertical. The survey instrument was the Brown pendulum apparatus. 11 gravity stations were established in Peru and 13 in Colombia. The results obtained at these stations are given in a table covering observed gravity, theoretical gravity, and anamalies. - V. S.

6890. Betz, F., Jr., and Hess, H. H. The Floor of the North Pacific Ocean. Geograph. Rev., New York, vol. 32, no. 1, 1942, pp. 99-116.

A discussion of bathymetric contours and new chart of the North Pacific. Correlation of certain gravity profiles and ocean deeps is given. Conclusion indicates pronounced intersecting linear trends of great length on the floor of the Pacific Basin which outline the Hawaiian swell. These trends may, it is suggested, represent zones of transcurrent faulting, and the Hawaiian swell may represent a thick lens of volcanic ejectamenta related to such a fault zone. - D. W., Mines Mag., vol. 33, no. 2, 1943.

6891. Gelfand, I. C. The Direct and Reversed Problems of the Potential of Gravity for a Homogeneous Spherical Segment (in Russian). Bull. Acad. Sci. U.R.S.S. (Izvestiia), Ser. Geophys., Moscow, no. 1, 1941, pp. 89-94.

The writer determines the potential of a homogeneous spherical segment by using the polynomial equations of Legendre. He then assumes that subterranean geological deposits have the shape of horizontally disposed spherical segments. As a result, a method of treating gravitational observations is devised, which is based on application of the previous calculations to the values of the gravity gradient and to the differences of terrestrial curvatures in the region explored. - V. S.

6892. Khmelevskaya, L. V. Occurrence of Oil as Related to Gravitational Anomalies. Comptes rendus (Doklady) de l'Academie des Sciences de l'U.R.S.S., Moscow, vol. 36, no. 6, 1942, pp. 182-184.

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The view prevails that no definite relationship exists between the distribution of gravitational anomalies and the occurrence of oil deposits. The writer considers that this view is based on a purely formal morphological approach. She studies the effects that the processes in the interior of the earth exert through the ages on the development of its surface. This approach leads her to the following conclusions:

(1) The oil-bearing strata in primary deposits are of a more ancient origin than the orogenic phase which originated the oil,

(2) The oil found in the vicinity of young orogenic regions is situated in zones of negative anomalies; here oil deposits are associated with young rocks not older than the gas-forming phase in the region concerned,

(3) The oil found in the vicinity of ancient orogenic regions is situated in zones of positive anomalies; this oil was primarily deposited in more ancient rocks than the orogenic phase responsible for structures in the respective region,

(4) The sign of anomalies can be changed by more recent movements creating new dislocations in the border portions of the ancient orogenic regions now forming parts of plateaus. - V. S.

6893. Longwell, C. R. Geologic Interpretation of Gravity Anomalies in the Southern New England - Hudson Valley Region. Bull. Geol. Soc. America, vol. 54, no. 4, 1943, pp. 555-590.

Pendulum stations occupied by the United States Coast and Geodetic Survey at locations chosen for the geologic significance provide a net in southern New England, eastern New York and northern New Jersey comprising about 120 stations. Numerous supplemental stations have been added with a modern gravimeter. Specific gravities of representative rocks near the pendulum stations have been determined.

Isanomaly maps based on isostatic, Bouguer, and free-air anomalies are remarkably alike in their major features. Some groups of anomalies reflect bedrock units that have exceptional densities. When corrections are applied for these local masses, regional tendencies are clarified. Two belts of negative anomalies are separated by a belt of positive anomalies. The negative belts correspond in a general way to axes of subsidence during Paleozoic periods. The entire region experienced orogenic deformation, followed by peneplanation.

Since the groups of Bouguer anomalies are little affected by the ordinary isostatic corrections, and are related only in minor

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degree to the visible bedrock, it appears that they either indicate considerable departures from isostatic balance or reflect differences in density that are concealed. Glennie's hypothesis of crustal warping, in a modified form, offers an attractive explanation of the outstanding anomalies. - Author's abstract.

2. MAGNETIC METHODS

6894. Brandl, W. Erdmagnetische Untersuchungen im Brockenmassiv (Magnetic Survey of the Brocken Massif). Preuss. Geol. Landesanstalt, Abh., N. F., no. 188, 1939, 82 pp.

A comparison between the results of a detailed magnetic and geologic survey of the Brocken massif (Harz Mountains region of Germany). The author interprets the magnetic picture of the region in terms of geologic and mineralogic characteristics. A microscopic study of the rocks as an aid in the interpretation is also included.

The rocks comprising the area vary considerably in mineralogy. They include both igneous and sedimentary types. The former vary in composition from a norite series and a gabbro series to a normal granite. A good correlation exists between changes in mineralogical composition and magnetic characteristics of the area. A combined geologic and magnetic map on the scale of 1 : 50, 000 is included.

The data used in compiling the magnetic portion of the map consist of 4,757 different magnetic stations. The station spacing for detailed traverses is between 80 - 150 meters, and for regional traverses about 1 kilometer. Scale values used ranged from 29.9 - 38.3 gammas. A total variation in ΔZ of more than 2,000 gammas was measured. - R.A.G., Ann. Bibl. Econ. Geol., 1941, vol. 14, no. 2, 1942.

6895. Johnston, H. F. American Magnetic Character-Figure, C_A, Three-Hour-Range Indices, K, and Mean K-Indices, K_A, for October to December, 1942, and Summary for Year 1942. Terres.Magnet. and Atmos. Elect., vol 48, no. 1, March 1943, Baltimore, pp. 19-27.

Tables are given. - W. A.

6896. Kalaschnikow, A. G. Die Hysteresis der schwachmagnetischen Sedimentgesteine (The Hysteresis of Weakly Magnetic Sedimentary Rocks). Comptes rendus (Doklady) de l'Academie des Sciences de l'U.R.S.S., Moscow, new ser., vol. 29, no. 5/6, 1940, pp. 368-371.

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Experiments were made to test the view that weakly magnetic sedimentary rocks are paramagnetic or diamagnetic. Sandstones interspersed with layers of sand were used as samples; one part of them behaved in strong fields paramagnetically, the other diamagnetically. It was found that in all samples the specific magnetic susceptibility varied with changes of the magnetic field. Moreover, a residual magnetism was discovered that made it possible to construct a hysteresis curve for weakly magnetic rocks; the author interprets hysteresis by the presence in these rocks of ferromagnetic, paramagnetic, and diamagnetic components. The results indicated that samples diamagnetic in strong fields showed a reduction of the susceptibility coefficient in weak fields and even changed to positive values. In most samples the ferromagnetic components reached their magnetic saturation in fields of an intensity of some 700-800 oersteds; in fields of greater intensity some samples became paramagnetic, others diamagnetic. The writer concludes that for the interpretation of magnetic anomalies only those coefficients of susceptibility which were established in magnetic fields of an intensity approximating that of the earth should be used in geophysical calculations. - V. S.

6897. Petsch, B. C. The Medicine Butte Anticline. South Dakota Geol. Survey Rep. of Investigations 45, Vermillion, S. Dak., 1942, 24 pp.

In 1940-42 the South Dakota Geological Survey investigated the large manganese deposit of the Medicine Butte anticline near Chamberlain, S. Dak. As a part of this investigation, E. L. Tullis made a geophysical survey with the magnetometer (see Geophys. Abs. 109, no. 6510). The magnetic variations of the region were found to correspond to its structural configurations. - V. S.

6898. Randell, J. T., Jr. Theoretical and Practical Magnetometric Comparisons. Canadian Min. and Met. Bull., Montreal, no. 355, 1941, pp. 495-512.

Theory governing measurements of the earth's magnetic field and the construction and use of various instruments for that purpose are discussed. Results of measurement in several different areas are given. Results from the Hotchkiss and Askania in another. - J.E.G., Ann. Bibl. Econ. Geol., 1941, vol. 14, no. 2, 1942.

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3. SEISMIC METHODS

6899. Explosives Engineer. Case History of a Seismic Shot, Wilmington, Del., vol. 20, no. 4, 1942, p. 1113.

A good example of a seismic reflection record provided by Mr. W. O. Price from work in the Lisbon oil field of Northern Louisiana. Reflections are shown from three horizons. - D. W., Mines Mag., vol. 33, no. 4, 1943.

6900. Gamburtsev, G. A. Correlation Method for the Registration of Refracted Waves (in Russian). Bull. Acad. Sci. U.R.S.S. (Izvestiia), Ser. Geog. Geophys., Moscow, no. 1/2, 1942, pp. 26-47.

In surveys made by the seismic method of refracted waves each successive wave must be isolated and observed; a correlation of successive wave appearances is important, even when the geological interpretation of observations is based only on the first appearances. The follow-up of first and succeeding appearances of refracted waves should be effected by devices analogous to those used in the method of reflected waves, such as (in particular) correlation by phases. The author states the essential requirements in regard to apparatus, means of producing explosions, methods of observation, etc.; one of the principal requirements is to increase the effective sensitivity of seismic apparatus, as it is possible to maintain a uniform record for repeated explosions only with a highly sensitive apparatus. At the end are given the main conclusions derived from the first experiments made by means of the correlation method. - V. S.

6901. Heck, N. H. What Geodesy Can Tell Us About Immediate and Ultimate Causes of Earthquakes (first paper in a symposium, The Interior of the Earth Viewed in Relation to Earthquake Causes). Jour. Appl. Physics, Lancaster, Pa., vol. 14, no. 3, 1943, pp. 104-114.

The writer explains earthquakes from a geodetic viewpoint. This approach is valuable because the crust of the earth is the seat of most earthquakes and an important part of the earth's interior. Geodetic measurements explain mainly the immediate causes of earthquakes. The methods of triangulation and leveling make it possible to furnish information about the movements of the crust by measuring the extent of surface slipping; they have provided the basis for the elastic rebound theory. The ultimate causes of earthquakes can be partly explained in terms of isostasy. However, isostatic compensations need to be reinforced by other forces to cause earthquakes, because important isostatic adjustments have taken place without earthquakes. The regidity of the

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crust, earth tides, polar shifts, etc., may be contributing causes. Meinesz, Visser, Gutenberg, and Richter find that earthquakes tend to occur in belts of negative anomalies associated with deep ocean troughs. (The other papers of the present symposium are abstracted under nos. 6902, 6904, 6905, 6906, 6907, and 6925.) - V. S.

6902. Hodgson, E. A. What seismology Can Tell Us About the Structure of the Earth's Interior (third paper in a symposium, The Interior of the Earth viewed in Relation to Earthquake Causes). Jour. Appl. Physics, Lancaster, Pa., vol. 14, no. 3, 1943, pp. 121-125.

Seismological evidence points to the existence of shallow and deep foci of earthquakes. Shallow foci are generated by the mobility of the earth's surface. This mobility results from processes which are enumerated. When the operation of these processes is resisted by friction, the accumulating energy ultimately produces an earthquake, so the "elastic rebound" theory maintains. Deep foci have been recognised only during the last 30 years. They reach to depths of about 700 km. and their existence can now be considered well-proved. Various criteria for identifying deep foci are cited. The deep foci now recorded are confined to five regions: Japan, the Netherlands East Indies, New Guinea, the New Hebrides, and the western part of South America; the deep foci lie farthest from oceanic deeps, and the shallow foci nearest to them. The author gives his explanation of deep foci. (The other papers of the present symposium are abstracted under 6901, 6904, 6905, 6906, 6907, and 6925.) - V. S.

6903. Housner, G. W. Calculating the Response of an Oscillator to Arbitrary Ground Motion. Bull. Seismol. Soc. America, Berkeley, Calif., vol. 31, no. 2, 1941, pp. 143-149.

The response of a simple oscillator to arbitrary ground motion may be determined by graphical or mathematical methods. The writer describes the mathematical methods. He uses Lord Rayleigh's "principle of superposition," which states that if two exactly similar oscillators are each acted upon by a different force, then adding the motion of the first oscillator to that of the second oscillator results in the same motion as would occur if both forces acted upon a single oscillator. By induction, this result can be extended to any number of forces. The case of an oscillator acted upon by a continuously varying force, the ground acceleration. The author gives the derivation of several equations and discusses their solution and application. - V. S.

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6904. Hubbert, M. K. Discussion of The Interior of the Earth Viewed in Relation to Earthquake Causes. I. What Geodesy Can Tell Us About Immediate and Ultimate Causes of Earthquakes. Bull. Seismol. Soc. America, Berkeley, Calif., vol. 33, no. 1, 1943, p. 115.

(See Abs. 6901.) Hubbert supports the view that isostatic adjustment cannot be a primary cause of earthquakes. He gives two reasons for such a conclusion. First, the process of mountain erosion is irreversible and cannot of itself produce a new mountain. When an existing mountain is reduced to a peneplane its potential energy is spent, and it is not available as the potential energy of a new mountain; a new supply of energy is necessary for such process. Second, isostatic adjustment and the erosion of a mountain have a different duration: "The time required to achieve any degree of isostatic equilibrium is of the order of 10^{-3} of that required for the corresponding approach to erosional completion." From these considerations, the author concludes that the cause of earthquakes lies in some large supply of energy, deep-seated within the earth, compared with which isostatic adjustment is relatively unimportant. - V. S.

6905. Lynch, Joseph. What We learn from Thermodynamics (sixth paper in a symposium, The Interior of the Earth Viewed in Relation to Earthquake Causes). Jour. App. Physics, Lancaster, Pa., vol. 14, no. 3, 1943, pp. 134-136.

Thermodynamics tends to support the view that the interior of the earth is largely solid. The thermal gradient is about 30°C. per kilometer at the surface of the earth, and it may be assumed to continue to the center with decreasing steepness. The melting point of rocks averages about 1400°C. at the surface and increases with pressure and hence with depth. The increase amounts to about 3°C. per kilometer; Bridgman has found indications that it continues throughout the earth, but at a slower rate. If the earth were originally a molten mass then, as shown by Jeffreys, the temperature gradient of such a liquid shpere would be about 0.3°C. per kilometer. Actually, the melting-point gradient is 10 times greater than this figure, namely, 3°C. rise per kilometer. Hence, a solidification of the earth would start not at the surface but at some depth. Similar deductions lead to the conclusion that the core of the earth is solid. If the solidification temperature of rocks at the surface is 1,400°C. and the melting-point gradient begins rising from 3°C. per kilometer from the surface down, the solidification temperature of 2,000°C. is attained at the depth of 200 km. and it must be higher than 2,000°C. at the core. Since the actual temperature of the core is generally estimated at 2,000°C. the core must be solid. Reviewing the other papers of the symposium, the writer finds that they support this view. (These papers are abstracted under nos. 6901, 6902, 6904, 6906, 6907, and 6925.) - V. S.

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6906. Lynch, W. A. Measurements of Terrestrial Magnetism Tell Us Little About Earthquakes but May Tell Us Much About the Interior of the Earth (fourth paper in a symposium, The Interior of the Earth Viewed in Relation to Earthquake Causes). Jour. Appl. Physics, Lancaster, Pa., vol. 14, no. 3, 1943, pp. 127-130.

Magnetism is not a cause of earthquakes; the necessary energy is not present, and no agency is known that could accomplish the transformation from magnetic to mechanical energy. Magnetism may, however, supply some information about the interior of the earth. It is known that ferromagnetic substances loose their magnetization at the Curie point: 780°C. for iron, 580°C. for magnetite, and 350°C. for nickel. The Curie point is raised by increased pressure, but this rise is believed to be slight. It is also known that temperature increases with depth near the surface of the earth at the rate of 30°C. per kilometer. Accordingly, all ferromagnetic substances may loose their magnetic properties at depths greater than 25 km., so that the seismologists' core of the earth would not be magnetic. Recent studies of Goranson, McNish, Van Orstrand, and Gutenberg have tended, however, to reduce the change of temperature with depth and to increase the rise of the Curie point with pressure. On this evidence, the core of the earth may be a ferromagnetic mixture of nickel and iron. (The other papers of the present symposium are abstracted under nos. 6901, 6902, 6904, 6905, 6907, and 6925.) - V. S.

6907. Macelwane, J. B. Tectonophysics or the Physics of Earth Deformation (fifth paper in a symposium, The Interior of the Earth Viewed in Relation to Earthquake Causes). Jour. Appl. Physics, Lancaster, Pa., vol. 14, no. 3, 1943, pp. 131-133.

Tectonophysics is defined by the author as the physics of earth deformation. Experiments of F. D. Adams, L. H. Adams, Bridgman, Griggs, Birch, and others, conducted with graphite, silica glass, silver, mica, and so on, have shown that the characteristics of materials and the mechanics of their deformation change with different conditions. Accordingly, the deformation of a geological structure under a given system of forces depends not only on the physical and chemical environment, geometric configuration, and boundaries, but also on the typical behavior of each individual material. The author concludes that an explanation of earthquakes in terms of elasticity is insufficient. Other considerations must be included, such as the fluidity, plasticity, and resistence of specific metals and rocks. (The other papers of the present symposium are abstracted under nos. 6901, 6902, 6904, 6905, 6906, and 6925.) - V. S.

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6908. Mukherjee, S. M. Seismological Features of the Satpura Earthquake of the 14th March, 1938. Proc. Indian Acad. Sci., Bangalore City, no. 16, part A, 1942, pp. 167-175.

The shock was felt over about 400,000 square miles. The position of the epicenter is calculated as 21° 31'N. and 75° 50'E. and the time of origin as $0^h48^m30^s$ G.M.T. The depth of focus is calculated as 40 km. The magnitude of the shock was about 5.5 and energy about 10^{19} ergs. Velocities of the various crustal waves are given. - Author's abstract.

6909. Neumann, Frank. An Appraisal of Numerical Integration Methods as Applied to Strong-Motion Data (third paper in The Determination of the True Ground Motion by Integration of Strong-Motion Records: A Symposium). Bull. Seismol. Soc. Am., Berkeley, Calif., vol. 33, no. 1, 1943, pp. 21-60.

The computation of earthquake motions from accelerograms involves primarily numerical integration. The author discusses the double-integration methods of calculating displacement curves, their practicability, and a system of checks. He then reviews the results of these methods as applied to the shaking-table tests at the Massachusetts Institute of Technology (see Abs. 91, no. 4011) and at the National Bureau of Standards (see Abs. 88, no. 3586). The pivot-type accelerometer is found satisfactory from an engineering viewpoint, and wave forms in terms of displacement can be accurately computed for all but the longer-period waves. A comparison is further made between displacement curves computed from accelerograph records by numerical double integration and the curves obtained by means of a torsion pendulum analyzer. Pendulum results deviate from numerical integration only by half the smallest displacement error found in the M.I.T. shaking-table tests, but they are subject to some uncertainty at the beginning of the motion (see Abs. 106, no. 6153; abs. 94, no. 4436; and Trans. Am. Geophys. Union, 17th Ann. Meeting, 1936). (The other papers of the present symposium are abstracted in nos. 6911, 6912, 6913.) - V. S.

6910. Petroleum World. Over 15 Seismograph Crews in Valley, Los Angeles, Calif., vol. 39, no. 2, 1942, pp. 25-26.

Reviewing present exploration activity in California where 15 seismograph parties are reported as active largely in Fresno and Kings Counties in the San Joaquin Valley, as of early 1942. Current wildcats and recent discovery wells of interest are noted. - D. W., Mines Mag., Denver, Colo., vol. 33, no. 3, 1943.

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6911. Ruge, A. C. Analysis of Accelerograms by Means of the M.I.T. Differential Analyzer (fourth paper in The Determination of True Ground Motion by Integration of Strong-Motion Records: A Symposium). Bull. Seismol. Soc. America, Berkeley, Calif., vol. 33, no. 1, 1943, pp. 61-63.

The M.I.T. differential analyzer is a machine for the mechanical integration of differential equations (see article by V. Bush, Jour. Franklin Inst., vol. 212, no. 4). It was here used as an integraph for the calculation of strong-motion velocities and displacements. Accelerograms of the shaking-table tests made at the Massachusetts Institute of Technology served as data. The original accelerograms were at first enlarged about 4-1/2 times; they were then fed into the machine set up for first and second integrals of acceleration. The integrals were next converted into velocities and displacements. The results obtained in the form of tabulations of ordinates were plotted, and smooth curves were drawn. Mechanical integration and numerical integration were discovered to be about equal in accuracy and time consumed. Furthermore, the differential analyzer was set for calculating and stamping the response of a damped pendulum. It was found that the differential analyzer and the torsion-pendulum analyzer calculate the pendulum response with about equal accuracy; this response can be satisfactorily substituted for the true displacement. (The other papers of the present symposium are abstracted under nos. 6909, 6912, and 6913.) - V. S.

6912. Ruge, A. C. Discussion of Principal Results from the Engineering Standpoint (second paper in The Determination of True Ground Motion by Integration of Strong-Motion Records: A Symposium). Bull. Seismol. Soc. America, Berkeley, Calif., vol. 33, no. 1, 1943, pp. 13-20.

The author discusses an investigation of simulated earthquake motions conducted jointly by the Massachusetts Institute of Technology and the United States Coast and Geodetic Survey by means of shaking-table experiments. He is concerned with the accuracy of strong-motion recording devices from an engineering standpoint. Will the calculated earthquake motions (based on instrumental records) have the same effects on a particular engineering structure as the actual earthquake motions? Comparisons are made between the various curves obtained in the investigation and the following principal conclusions are reached:

(1) The accuracy of Coast and Geodetic Survey accelerometers under simulated earthquake motions is satisfactory,

(2) Displacements and velocities computed by numerical integration agree closely with the actual displacements and velocities,

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(3) Integration of accelerograms by the M.I.T. Differential Analyzer agrees well with numerical integration. (The other papers of the present symposium are outlined under nos. 6909, 6911, and 6913.) - V. S.

6913. Ruge, A. C., and McComb, H. E. Tests of Earthquake Accelerometers on a Shaking Table (first paper in The Determination of True Ground Motion by Integration of Strong-Motion Records: A Symposium). Bull. Seismol. Soc. America, Berkeley, Calif., vol. 33, no. 1, 1943, pp. 2-12.

The Massachusetts Institute of Technology and the United States Coast and Geodetic Survey have investigated jointly the accuracy of accelerograms of earthquake motions. The investigation was made by means of shaking-table experiments (see Abs. 91, no. 4011). The present paper is the first in a symposium describing the results obtained. It states the objectives of the research and describes the instrumental work. The main objective is to determine the agreement between actual displacements imposed upon the accelerograph by the shaking table and those obtained by integrating the recorded acceleration. The shaking table and its operation were described in a previous article (see Abs. 87, no. 3346). The particular apparatus used in the investigation is now discussed and illustrated by diagrams. 51 tests were made, and 6 accelerograms were selected for analysis. Exanples are reproduced in the test. (The other papers of the present symposium are abstracted in nos. 6909, 6911, and 6912.) - V. S.

6914. Ulrich, F. P. Progress Report on Strong-Motion Earthquake Work: January, February, March, 1943. United States Coast and Geodetic Survey, MSP - 44, 1943, 2 pp.

During the first quarter of 1943 the Coast and Geodetic Survey has continued its work, which the present report summarizes under the headings: (1) Questionnaire program; (2) Strong motion work; (3) Vibration work: and (4) Principal earthquakes: February 22 and March 30, 1943. - V. S.

6915. Wingate, F. G., and Finch, R. H. Eruptions of Mauna Loa, April 26 to May 10, 1942. Bull. Seismol. Soc. America, Berkeley, Calif., vol. 33, no. 1, 1943, pp. 65-67.

This press notice describes the Mauna Loa earthquakes in regard to such details as time sequence, progress of cracking, succession of shocks, direction of the lava flow, rate of flow, danger to Hilo, unsuccessful bombing with a view to diverting the lava, natural diversion of the flow, termination of eruptions, and seismological records. The principal feature of the summit

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eruption was a lava flow that coursed a few miles down the northern slope of the mountain. On the northeast, the cracks extended 2 miles below the source of the flow; the lava fountains were three-fourths of a mile long. The distance across the flow from Hilo to Puna was more than 1,000 yards. The front of the flow averaged at least 25 feet thick. The principal earthquake reached a depth of some 30 miles. During the period April 5 - May 10 the seismic-disturbance records ranged from 9 to 539 per week. - V. S.

4. ELECTRICAL METHODS

6916. Bowsky, M. C. Correlation by Electrical Logs. Tomorrow's Tools - Today, Los Angeles, Calif., vol. 8, no. 2, 1942, pp. 28-29.

The purpose of this article is to point out some methods that might assist in the correlation of electrical logs. In choosing the type of curve the resistivity of the drilling mud is the decisive factor. Generally, the mud is suitable for both the normal potential curve and the normal apparent resistivity curve (otherwise called shallow penetration resistivity curve); but in cases where the mud has extremely low resistivity the normal apparent resistivity curve alone must be used. Correlation work should begin with a general review of the log. In identifying the various sands in a group, the logs may be lined up so that the sands are level. When the electrical logs are correlated with sea level, they may indicate the regional dip and the convergence or divergence of formations. An amplification of the response of the normal apparent resistivity curve is helpful in correlating long shale sections. Bentonite streaks can be characteristic of a certain depositional history and become excellent geological markers. - V. S.

6917. Grier, A. J. The Standard Geo-Electric Set. Pamphlet, Berkeley, Calif., December 31, 1941.

A pamphlet describing the standard geo-electric set made by Standard Geophysics of 1684 University Avenue, Berkeley, Calif., which is a self-contained instrument for determining potential drop ratios of successive adjacent portions of the ground between three electrodes while current from auxiliary batteries flow between two current electrodes. The instrument is described, and results of a traverse across a quartz vein shown. - D. W., Mines Mag., Denver, Colo., vol. 33, no. 3, 1943.

6918. Mining Journal. Barry Storm Credits M-Scope in Finding Copper Deposit, Phoenix, Ariz., vol. 25, no. 24, 1942, p. 16.

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A brief report of the location of a lode of copper ore some 2 miles north of Apache Lake, in the Superstition - Four Peaks region east of Mesa, Arizona. Mr. Storm, who was awarded the title "Model Prospector of 1941" by the Phoenix (Ariz.) Engineers Club, credits the discovery to the M-Scope, a portable electromagnetic induction instrument which he used in investigating the property. The find was made within about 50 feet of an old pack trail, and a 50-foot exploration shaft has shown a steady rise in values. The instrument and its operator are shown in photograph. - D. W., Mines Mag., Denver, Colo., vol. 33, no. 3, 1943.

6919. Sherborne, J. E., and Newton, W. M. Mud Resistivity in Electric Logging. Petrol. World, Los Angeles, Calif., vol. 38, no. 12, 1941, p. 58.

Brief comment on discussion at A.I.M.E. meeting concerning the relation of the resistivity of chemicals used in treating drilling mud to results of electrical logging. Resistivity of mud was concluded to have an important effect on such logs. - D. W. Mines Mag., Denver, Colo., vol. 33, no. 3, 1943.

6920. Stick, J. C., Jr. Modern Instruments Provide Speed and Accuracy in Electrologging. Tomorrow's Tools - Today, Los Angeles, Calif., vol. 9, no. 1, 1943, pp. 28-29.

Electrical logging has been recently perfected by the addition of new devices to equipment. Advances in radio have resulted in the development of galvanometers capable of a recording speed up to 300 feet per minute, with extreme accuracy. The copper collector rings, which transmit the electrical current from the cable hoist drum, have been replaced by metal disks revolving in pools of mercury. The Eastman Kodak Co. has developed a prehardened survey recording film which can be hand-processed at temperatures in excess of 100°F., does not stain, dries quickly, and withstands the most severe handling; a field print may be obtained within a few minutes. As a result of new improvements, electrical logging has gained in speed and precision. - V. S.

6921. Stick, J. C., Jr. Types of Electrical Measurements in Electrical Logging. Tomorrow's Tools - Today, Los Angeles, Calif., vol. 8, no. 1, 1942, pp. 4-7, 29.

Three main types of measurements are used today in commercial electrical logging: (1) Measurements of natural electrical voltage between different formations in a borehole, expressed by a natural potential curve; (2) measurements of electrical resistivity close to the borehole, within the zone infiltrated by the

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drilling mud, expressed by a shallow-penetration resistivity curve; and (3) measurements of formations to indicate their natural resistivity behind the zone of mud infiltration, expressed by a deep-penetration resistivity curve. The author discusses each curve, the ways of increasing its precision, and the resistivity formula. The natural potential curve is precise when measurements are made with the use of pure lead electrodes, comparatively large electrode surfaces, and a down-the-hole ground. The shallow penetration resistivity curves are of two types: (a) The detail curve measures the formation resistance between a single exploring electrode and a suitable ground return electrode, (b) the averaging curve measures the resistivity of formations exceeding a specific thickness, the thinner formations being averaged out; the electrode spacing is so chosen that the formation averaging effect is greater than that obtainable with the detail type. The deep-penetration resistivity curves range in lateral depth of penetration from 6 feet to 25 feet. To increase the accuracy of response to thinner formations, the amount of formation within the zone of measurement is greatly reduced over equivalent single potential-type spacings by placing the potential pick-up electrodes close together. - V. S.

6922. Stick, J. C., Jr., Winter, A. B., and Bowsky, M. C. Shallow Penetration Curves. Tomorrow's Tools - Today, Los Angeles, Calif., vol. 8, no. 2, 1942, pp. 16-19.

This paper deals with the practical uses of shallow-penetration resistivity curves, the detail curve and the averaging curve. The uses are: (1) Differentiation among formations; (2) correlation; (3) determination of depth of formation; and (4) study of the physical characteristics of strata. The writers discuss the principal applications. The differentiation between shales and all other formations is possible because shales have low resistivity and permeability, while the resistivity of other formations depends on their permeability, original resistivity, and infiltration by borehole fluid. The type of curve must be chosen according to the minimum thickness of formation to be indicated. The minimum thickness to which the averaging curve responds is equal to the depth of lateral penetration of the curve. In problems of correlation the shallow-penetration curves can be profitabley used because of their extreme range of measurement. Averaging curves have the advantage of reducing excessive detail where intricate interbedding of formations complicates correlation of the major zones. Detail curves are valuable because they pick up small changes of formation character. - V. S.

6923. Winter, A. B., Bowsky, M. C., and Stick, J. C., Jr. Correlation between Electrical Logs and Radioactivity Logs. Tomorrow's Tools - Today, Los Angeles, Calif., vol. 8, no. 3, 1942, pp. 4-7.

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There are two types of curves in radioactivity logging: (1) The gammaray curve, which is a measure of the natural gamma-ray intensity of the formation; and (2) the neutron curve, which measures the intensity of the gamma rays resulting from the bombardment of the formations with a strong source of neutrons. These radioactivity logs can be usefully correlated with an electrical log. Undoubtedly, the electrical log and the radioactivity log, being measurements of entirely different properties of the formations, have totally different response characteristics. However, if the typical response for the various types of formations on the gamma-ray curve or neutron curve is understood, it is possible to correlate the gamma-ray curve or the combination gamma-ray and neutron curve readily with the electrical logs from well to well. The distinctive characteristics of radioactivity logs and adjustments in the scale sensitivity of their curves are discussed. Attention is likewise paid to the problem of distinguishing between sands and limestones. - V. S.

6924. Zinszer, R. H. The Use of Electrode Spacing in Well Logging. Am. Inst. Min. and Met. Eng. Tech. Pub. no. 1590, New York, 1943, 10 pp.

Application of electric logs has been used in correlation of subsurface structure to determine the size and shape of the oil reservoir. Such a knowledge is hardly complete until saturation and productivity are determined for the various horizons. It is difficult to use electric logs successfully for this purpose because of the many factors that influence the curves. In this work an effort was made to establish an empirical correlation between formation resistivity for a series of electric-log curves and water saturation and oil productivity of sand. Electric logs were obtained by recording with 10 different electrode spacings through the same interval of a well. In the analysis of these curves all factors except two, a dependent and independent variable, were analyzed in the core laboratory in order to compare the values of permeability and saturation with the measured values of formation resistivity.

Results of this analysis indicate : (1) the depth to which mud filtrate enters a sand body, (2) a correlation between permeability and sand resistivity for shallow penetration depths, and (3) that the water saturation for an oil sand can be determined from the measured sand resistivity after making suitable corrections for sand thickness. The procedure in the last method depends on a correction for thickness factor and a theoretical curve. The accuracy of the theoretical curve is now being tested in the laboratory. - Author's abstract.

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5. RADIOACTIVE METHODS

6925. Barklow, J. C. Radioactivity Well Logs - Their Use and Applications. Tomorrow's Tools - Today, Los Angeles, Calif., vol. 7, no. 5, 1941, pp. 4-5.

The major oil deposits in the United States are being rapidly found and drilled. Therefore, much more attention will have to be devoted in the future to secondary recovery in the existing pools. Present economic conditions in the oil industry indicate that this must be done at a relatively low cost. The author considers that radioactivity well logs present an answer to a large part of this problem. Much experimental work has been done in applying radioactivity to well logging. Advances were also made in the technique of producing radioactivity logs. With growing use, many applications are being developed. The principal application is made in wells cased and exploited to capacity at their present producing horizon. Radioactivity logs may also be utilized for mapping subsurface structure for deeper drilling. Where core drilling is proposed, preliminary shallow holes may be used, surveys made, and radioactivity logs correlated at reduced cost. Sometime a radioactivity log may be used where an electric log fails. The many advantages of radioactivity logs assure them a prominent future in the petroleum industry. - V. S.

6926. Beers, L. C. Radioactivity Logging reclaims Depleted Wells in the Long Beach Field, California. Tomorrow's Tools - Today, Los Angeles, Calif., vol. 8, no. 1, 1942, pp. 12-13, 31.

The petroleum industry faces the problem of increasing oil production for national defense in spite of the sharply reduced allotment of steel pipe and equipment. In this situation, the reworking of old wells with a minimum equipment assumes increased importance. Radioactivity logging answers this problem optimally. The difficulties of locating new shallow zones in old wells are surmounted by logging strata through the casing. Many California producers have developed comprehensive work-over programs utilizing this method. The author describes the application of radioactivity logging in the Long Beach field, California, and outlines the procedure which gives the best results in the field. This procedure is low in cost and requires little or no new equipment. - V. S.

6927. Beers, L. C. Radioactivity Logs in Cased Wells correlate with Gun-Barrel Formation Samples. Tomorrow's Tools - Today, Los Angeles, Calif., vol. 7, no. 9, 1941, pp. 4-5.

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Radioactivity logging is increasingly regarded as essential to profitable work-over programs in oil fields. The normal procedure is first to run the radioactivity log to locate the potential oil bearing strata. Sands are relatively low in radioactivity, limestones are of intermediate strength, and shales are relatively high in radioactivity. The radioactivity log is compared with the driller's log and the sample log of the well, and also with the general statigraphic sequence and productive history of the area. Then all the sands and limes are tested progressively from the bottom upward, until a satisfactory horizon is located for operation. A high degree of correlation has been found between radioactivity logs and gun-barrel formation samples. Formation samples are carefully recovered behind the casing from gun barrels and chambers and they are subjected to microscopic analysis. In all the instances studied such a sample log of perforations agrees very fully with the radioactivity log of the well. - V. S.

6928. Cantrell, Ralph. Radioactivity Logs Aid in Making Gulf Coast Work-Overs Worth While. Tomorrow's Tools - Today, Los Angeles, Calif., vol. 8, no. 2, 1942, pp. 12-13.

Radioactivity logging can be made through the casing. It employs a highly sensitive detector which measures the gamma rays that enter the hole from the adjacent formations. An ionization current produced by these rays is amplified and transmitted to recording equipment at the surface. As the instrument is pulled up the hole, the gamma ray intensities of the formations are recorded on a paper chart. The writer gives five examples of the application of radioactivity logging to work-over programs in Texas and enumerates other possible uses. The full scope of the adaptability of the radioactivity log is probably not yet fully realized. - V. S.

6929. Hess, V. F. What Radioactivity Tells Us About the Interior of the Earth (second paper in a symposium, The Interior of the Earth Viewed in Relation to Earthquake Causes). Jour. Appl. Physics, Lancaster, Pa., vol. 14, no. 3, 1943, pp. 116-120.

The heat production of the radioactive substances embedded in the rocks is very important for the treatment of the problem of the cooling of the earth. Recent average results of Evans, Goodman, and others are much lower than previously accepted figures.

It is pointed out that if one computes the ionization produced by the gamma-rays from radioactive substances in rocks and soil from Evans and Goodman's figures, the expected ionization

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turns out considerably smaller than the one actually observed by placing ionization vessels over land and water. An experimental study of this discrepancy is planned.

It is shown that plausible assumptions as to a layered depth distribution of radioactive matter lead to temperatures in the core of only 2,000°C., even if the older and higher data for the radioactive heat production in the rocks are accepted. A gradual heating of the core itself is to be expected (Slichter) if the amount of radioactive matter in the core is not smaller than that in iron meteorites. - Author's abstract.

The other papers in the present symposium are abstracted under nos. 6901, 6902, 6904, 6905, 6906, and 6907.

6930. Neale, J. J. Proper Completion Assured by Radioactivity Logs. California Oil World and Petrol. Industry, Los Angeles, Calif., vol. 36, no. 6, 1943, pp. 10-11; also Tomorrow's Tools - Today, Los Angeles, Calif., vol. 9, no. 1, 1943, pp. 22-23.

To insure the proper placement of gun perforations, some operators are running a gamma-ray (radioactivity) log before doing any gun perforating at all. Radioactivity logging can be made through the casing by moving a highly sensitive detector in the well. The gamma rays originating in the formation pass through the casing and cement and identify the character of the formation. The instrument consists of an ionization chamber above which is an amplifier. An ionization current produced in the chamber by the gamma rays is transmitted to the surface, where a gamma-ray curve is traced. From this curve formational conditions are interpreted and their depth accurately determined. The author gives examples of wells which show that radioactivity logging more than repays its cost. - V. S.

6931. Uren, L. C. Radioactivity and Geochemical Well Logging. The Petroleum Engineer, Dallas, Tex., vol. 14, no. 4, 1943, pp. 50-58.

The author discusses radioactivity logging in respect to theoretical basis, equipment, interpretation, utility, distinction between gamma-ray logging and neutron logging, and subsurface radioactivity study. He further treats of geochemical logging in regard to theoretical basis, formation sampling, chemical analysis, graphical method of displaying data, interpretation of logs, and evaluation of geochemical logging. The first article (see Geophys.Abs. 112, no. 6814) dealt with electrical logging; in the forthcoming articles the writer proposes to discuss caliper logging, temperature logging, rate-of-penetration logging, and logging by inspection of the drilling fluid. - V. S.

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6932. Winter, A. B. Use of Neutron Curves. Tomorrow's Tools - Today, Los Angeles, Calif., vol. 8, no. 4, 1942, pp. 14-15.

The neutron curve is generally used as a companion curve to the gamma-ray curve in radioactivity logging. It has been found to aid in determining the character of the formation behind casing. The equipment used for neutron logging is described. Satisfactory logs may be made with or without fluid in the hole. The uses of neutron logging are several. One application is the determination of dense limestones or hard sandstones. Another is the detection of porous zones in a uniform limestone formation: it is made possible by the presence of oil or water in the pores. To detect porous zones both the gamma-ray curve and the neutron curve are necessary: gamma rays show thickness, while low neutron values indicate porosity. Shales have still lower values on the neutron curve. A third application of the neutron log is the determination of the casing seat. The point of entering or leaving a string of casing is not always apparent on a gammay-ray curve. - V. S.

Winter, A. B., Bowsky, M. C., and Stick, J. C., Jr. Correlation Between Electrical Logs and Radioactivity Logs. See Abstract 6923.

6. GEOTHERMAL METHODS

6933. Winter, Burm. Accuracy in Temperature Surveys necessary for Successful Application. Tomorrow's Tools - Today, Los Angeles, Calif., vol. 8, no. 1, 1942, pp. 20-23.

With the increasing depth of oil wells the study of subsurface temperatures grows in importance. At present, greater precision has been gained in temperature surveys by the use of the resistance-element type of thermometer. This apparatus records temperatures at the surface as the thermometer passes down the hole. The equipment is described. Temperature surveys have several applications. One commercial application is the location of the tip of the cement behind the casing following a cement job. Owing to generation of heat in the setting of cement, a definite change in temperature occurs opposite the cemented zone; the kind and nature of the formation covered by the cement will influence the temperature indications. Other applications of temperature surveys are enumerated= - V. S.

7. GEOCHEMICAL METHODS

6934. Henderson, Homer. Surface Analysis Can Now Tell Hydrocarbon Source. Oil Weekly, Houston, Tex., vol. 109, no. 5, 1943, pp. 49-50.

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The increasing demand for oil, the draining of existing fields, and the diminishing discovery rate make it imperative to find a cheap but efficient oil-prospecting method. Microscopic surface analysis gives promise of being such a method. The presence of hydrocarbons on the surface in the form of oil springs, gas seeps, and "paraffin earth" has for a long time been accepted as an indication of oil at depths. Hydrocarbon molecules leak off from subterranean petroleum deposits and slowly rise to the surface. The main difficulty of microscopic detection is to differentiate between petroleum hydrocarbons and surface hydrocarbons generated by decaying vegetables. This differentiation is extremely difficult by chemical methods. But a physicochemical method has been developed which utilizes the physical, geological, and chemical characteristics of surface hydrocarbon concentrations, such as saturation, configuration, geological substratum, etc. - V. S.

6935. Smith, G. K. Surface Analyses of Hydrocarbons a New Development of Oil Analysis. International Oil, Houston, Tex., vol. 3, no. 1, 1942, pp. 71-73.

A general discussion of soil-analysis prospecting in which surface distribution of hydrocarbons is examined. A method that distinguishes between hydrocarbons diffused from petroleum and vegetable waxes, called a "physicochemical" method, is mentioned and its advantages pointed out. Three figures showing surface hydrocarbon distribution over different geological situations are given. - D. W., Mines Mag., Denver, Colo., vol. 33, no. 3, 1943.

6936. Smith, R. O. Geochemistry's Place in Future Exploration. World Petrol., New York, vol. 14, no. 3, 1943, pp. 45-47, 49.

The chief difficulty of geochemical prospecting is identifying the surface hydrocarbons traceable to oil deposits. In Russia it has been possible to utilize the ratio of ethane to methane in the gaseous hydrocarbons of oil; in America oil hydrocarbons are of a less reactive type, and the chemical problems become more complicated. There exist also other difficulties. Lime strata sometimes cause concentrations of hydrocarbons of noncommercial proportions, so that it is necessary to distinguish between oil fields producing from lime and from sand. The apparent structure may shift with depth, probably in the direction of the convergence of strata, so that the oil prospect does not exist directly under the surface zone indicated by a geochemical survey. Some hydrocarbons come up more vertically than do others. As a result, geochemistry cannot at present outline an oil field with precision. The most promising mission of geochemistry is the detection of new fields. Where adequate surveys have been made, 4 wells have come in out of every 10 recommended. - V. S.

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Uren, L. C. Radioactivity and Geochemical Well Logging. See Abstract 6931.

6937. ZoBell, C. E. Influence of Bacterial Activity on Source Sediments. Oil Weekly, Houston, Tex., vol. 109, no. 8, 1943, pp. 15-26.

Microbiological exploration for petroleum is based on the role of bacteria in the formation of oil deposits. Some bacteria may promote the conversion of organic matter into crude oil, others may prevent it. A discussion is given of the effects of bacterial activity on the chemical composition of sediments. Much further information is necessary in regard to the formation of protopetroleum and environmental conditions before microbiological prospecting can be fully utilized. The transformation of organic matter into petroleum is the subject of American Petroleum Institute Research Project 43A, carried on jointly by the Scripps Institution of Oceanography, the Pennsylvania State College, and the Massachusetts Institute of Technology. - V. S.

8. UNCLASSIFIED METHODS AND TOPICS RELATED TO GEOPHYSICS

6938. American Petroleum Institute, Committe Reports on Petroleum Reserves in 1942. Quarterly, New York, vol. 13, no. 2, 1943, pp. 3-4.

Proved reserves of crude oil in the United States, as of December 31, 1942, amounted to 20,082,793,000 barrels, which is 493,497,000 barrels higher than estimates of January 1, 1942. This increase is the net result of the discovery and development, through extensions and additions to pools discovered in previous years and through the discovery of new pools in 1942, of a total of 1,878,976,000 barrels of new oil as against 1,385,479,000 barrels of crude oil produced during the year. It must be recognized, however, that today's known oil can be recovered only over a period of many years and at gradually declining annual rates. Two tables accompany the report of the Committee: (1) Estimated proved petroleum reserves in the United States, and (2) summary of committee's annual reports covering period 1937-42. - V. S.

6939. American Petroleum Institute. Not Enough Oil Found Last Year, Says Boyd. Quarterly, New York, vol. 13, no. 2, 1943, p. 5.

William R. Boyd, Jr., president of the American Petroleum Institute, finds that the United States petroleum industry did not find nearly enough oil in 1942. This conclusion is supported by the report of the A.P.I. Committee on Reserves and the report

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of the Petroleum Administrator for War. The report of the A.P.I. Committee shows a total addition to reserves in 1942 of 1,878,976,000 barrels of crude oil, less the consumption of 1,385,479,000 barrels during the year. However, only 260,051,000 barrels of the total was from the new fields discovered in 1942. This amount is substantially smaller than the volume of discoveries from new fields in any recent years and compares unfavorably with the average estimate of 559,243,000 barrels for each of the past 5 years. - V. S.

6940. DeGolyer, E. L. Problem of Exploration. Bull. Am. Assoc. Petrol. Geol., Tulsa, Okla., vol. 26, no. 7, 1942, pp. 1214-1220.

The estimates of United States oil reserves are reviewed and found discomforting. The rate of discovery declines. Exploratory techniques have limits of usefulness; they gain acceptance slowly, reach a peak rapidly, and then lapse into relative obscurity; examples are given. The task facing the oil industry is to find new exploratory methods and new fields. - A. L., Jour. Inst. Petrol., vol. 29, no. 230, 1943, condensed by V. S.

6941. DeGolyer, E. L. Problem of Exploration during the War. Oil Weekly, Houston, Tex., vol. 109, no. 5, 1943, pp. 39-41.

The essential facts in the present oil situation are as follows: (1) War and civilian consumption of petroleum may be expected to increase. In 1942 the demand was roughly 1,400,000,000 barrels; for the next 2 or 3 years, not less than 1,500,000,000 barrels will be needed annually; in subsequent years still more may be required. (2) The current rate of finding oil is too low. The disappointing results of existing methods of exploration are not due to a slackening of efforts, for intelligently directed exploration is at an all-time peak. Nor are these results due to a decrease in the total number of newly discovered fields, because in 1939-42 nearly 215 discoveries were made annually, while in 1935-38 the average was 130 discoveries. (3) The answer appears to lie in the rate at which the large fields are discovered. The most recent estimates of the average new oil discovered per field are 15,600,000 barrels for 1935-38, and 3,200,000 barrels for 1939-42. (4) Our present crop of prospects is not encouraging in size and quality. The average size of new fields discovered in 1942 is now estimated to be 1,200,000,000 barrels; further development of these fields will undoubtedly increase this estimate but not to an extent comparable with returns before 1939. Without new discoveries our productive capacity will be inadequate by the end of the year. (5) Apparently the areas susceptible to existing methods of exploration have been largely discovered, and new methods

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should be found. In the future, attention must be directed predominantly at stratigraphic traps, and all known means of exploration must be employed in increasing our finding rate. Increased exploratory funds and more cooperation will be necessary to accomplish this purpose. - V. S.

6942. Eckhardt, E. A. Geophysical Operations at Peak Levels during 1942. Oil Weekly, Houston, Tex., vol. 109, no. 5, 1943, pp. 49-50.

In 1942 the distribution of geophysical parties by type of exploration was as follows: seismograph, 75 percent; gravimeter, 19 percent; magnetometer, 5 percent; other methods, 1 percent. The average number of seismographic parties in the United States was, for the last 5 years: 202 in 1938, 189 in 1939, 189 in 1940, 191 in 1941, and 226 in 1942; thus, 1942 showed an increase of 18.3 percent over the year 1941. The geographic distribution of exploration was: Texas, 42 percent; Louisiana, 12 percent; Oklahoma, 11 percent; California, 9 percent; Kansas, 4 percent; Southeastern States, 13 percent; Illinois Basin, 7 percent; others, 2 percent. Texas also made the greatest contribution to the new reserves discovered in 1942, namely, 40.1 percent. The author gives two charts illustrating the principal figures.

Notwithstanding the high level of geophysical activity, Petroleum Administrator Ickes has reported that since 1938 the petroleum industry has in no year discovered new reserves equaling in volume the crude oil consumed in that year. He has asked the industry to drill 4,500 wildcat wells during 1943, almost 50 percent more than were ever before drilled during 1 year. The geophysical personnel has received, however, no corresponding occupational exemptions from the draft; only 15 percent to 20 percent are given draft deferment. Personnel losses of some geophysical operators reach 40 percent. Therefore, the necessary expansion of the oil industry is not likely to be realized unless the severe shortage of geophysicists is remedied. - V. S.

6943. Explosives Engineer. Explosives under Full War-Time Control. Wilmington, Del., vol. 20, no. 2, 1942, pp. 38-44, 58-60.

The full text of the new Federal Explosives Act and Administrative Regulations issued by United States Bureau of Mines, is given. Much new Law governs handling of explosives and is of interest to geophysical users, details of which are given. - D. W., Mines Mag., Denver, Colo., vol. 33, no. 3, 1943.

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6944. Freeman, L. I. Accelerated Discovery through Geophysics. World Petrol., New York, vol. 14, no. 3, 1943, pp. 48-49.

In 1943, the most critical year of the war, only a fraction remains of the United States crude-oil reserves of 20 billion barrels. Therefore, the accelerated discovery of new fields is of paramount importance. Such discovery is the task of geophysicists. Yet, the geophysical personnel and material have been reduced by the demands of the war. The solution of these difficulties lies in more efficient exploration. Each party must have its own field of operation suited to its equipment. District offices must be authorized to reach quick decisions in making appraisals, assembling leases, and conducting exploratory drilling. Active consultation and the pooling of information within each area must be encouraged. These suggestions involve procedures never yet used by oil companies, but the present emergency demands a radical change of policies. - V. S.

6945. Goldstone, F. Maintaining an Adequate Level of Geophysical Exploration. Oil and Gas Jour., Tulsa, Okla., vol. 41, no. 48, 1943, pp. 56-61.

The Petroleum Administration has recommended the drilling of 4,500 wildcat wells in 1943. Geophysicists must carry out this program so judiciously that neither steel nor manpower will be wasted in unjustified drilling. In analyzing this task, the author discusses methods of prospecting, broadening of exploration, need for planning, and shortage of personnel. He considers that geophysics might be utilized in four general ways: (1) Existing techniques can be applied with greater precision to the already explored areas; (2) methods of structural mapping can be taken to new territories inadequately explored in the past; (3) areas offering particular geophysical difficulties and so far neglected may be tackled; and (4) new geophysical methods can be found to revitalize exploration. - V. S.

6946. Heiland, C. A. Mining Geophysics. Eng. and Min. Jour., New York, N. Y., vol. 142, no. 8, 1941, p. 103.

Noting that the birth of mining geophysics dates back to the beginning of the 17th century the writer examines the relative pace of geophysical prospecting in oil exploration and in mining. The factors in relation to the use of geophysics in mining, such as complexity of the problem, effect of topography and the like, are examined. The future of mining geophysics is considered as lying in systematic large-scale surveys to establish geologic relationships. Such surveys are already well begun in the Lake Superior region, in the Rand area of South Africa, and in surveys near present properties and

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abandoned mines in the search for extensions. - D. W., Ann. Bibl. Econ. Geol. 1941, vol. 14, no. 2, 1942.

6947. Henry, F. R. Alberta Basin becomes Important Factor. Oil Weekly, Houston, Tex., vol. 103, no. 8, 1941, pp. 40-42.

The writer discusses the regional geology and structure of the Alberta Basin and the significance of the recent discovery of commercial oil at the Twin River. Structure in southern Alberta, which sits between Turner Valley and the northern Montana fields. The Alberta Basin has come of age in having passed the 100 million barrels production mark. Structural cross sections of several fields are given and a graphic log and an electrical log of the Spring Coulee structure are presented. The possibilities of the basin in general are treated. - D. W., Ann. Bibl. Econ. Geol. 1941, vol. 14, no. 2, 1942.

6948. Illing, V. C. Geology Applied to Petroleum. Proc. Geol. Assoc., London, vol. 53, no. 3/4, 1942, pp. 156-187.

The writer deals, in part, with oil discovery. He discusses the origin, migration, and accumulation of oil and the types of regional structures in which oil fields are developed. The regional structures considered are: horizontal strata, areas of gently inclined rocks, folded strata, regions of normal faulting, salt-dome regions, and unusual types of structure.- V. S.

6949. Kornfeld, M. M. Shallow Wilcox Accelerates North Louisiana Development. Oil Weekly, New York, vol. 103, no. 2, 1941, pp. 16-25.

Electrical logs of the Wilcox section at Walters, at Olla, and Nebo, three fields opened in north central Louisiana in the past 18 months, are given. The history of the development of this area is given. It appears that magnetic mapping when corrected (presumably for regional effects) shows the top of a regional feature of which the Olla trend is a part. Geophysics adapted to mapping subsurface faulting detail and new geologic conceptions of structure and faulting will play a part in further development of Wilcox trends and production according to the author. Mud analysis logs of the Olla field show maximum oil concentration at 2,210 to 2,221 ft. where good production was obtained. - D. W., Ann. Bibl. Econ. Geol., 1941, vol. 14, no. 2, 1942.

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6950. Levorsen, A. I. Declining Rate of Discovery Poses Urgent Problem for Oil Industry. World Petrol., New York, vol. 13, no. 12, 1942, pp. 37-39, 72.

The writer cites statistics showing that during recent years the U. S. oil reserve has been 12 to 15 times the annual production of oil. Yet, only about a quarter or a fifth is producible in the next few years; the rest will be obtained at steadily declining rates over a period of 20 to 30 years. Thus, unless new fields are found, the existing supplies would not meet daily demand for long. Further statistics show that, to maintain the same rate of increase in supply and demand in the next 20 years, with the same ratio of reserve to annual consumption, would require the discovery of a quantity of oil equal to that found in the past 80 years. New fields can be found both in developed areas and partly explored regions. But their discovery will need more vigorous wildcatting, the testing of new methods, and the employment of more geologists and geophysicists. - G.D.H., Jour. Inst. Petrol., vol. 29, no. 230, 1943, condensed by V. S.

6951. Levorsen, A. I. Discovery Thinking. Oil Weekly, Houston, Tex., vol. 109, 1943, no. 6. pp. 11-17, 26; no. 7, pp. 14-17, 20; no. 8, pp. 12-13, 26-28.

Part 1 of this article suggested that if the industry is to discover the huge volumes necessary to keep supply in balance with future demand, it must commence thinking in terms of "big" geology, which means in terms of wholly new oil provinces instead of individual fields, and square miles in place of acres. As examples, two types of geological concepts or principles are presented to show the kind and the scale of thinking that seem to be called for in an attempt to formulate a better idea of the nature and extent of the undiscovered reserves of petroleum in the United States. The first of these was up-dip wedge belts of porosity in reservoir rocks and the second was geologic strata which are separated by unconformities.

Part 2 said that with still vast quantities of favorable formations, the declining rate of discovery indicated something was seriously wrong with prospecting technique. It declared there was need for creative geology in place of routine geology, with opportunity and encouragement provided for developing new ideas. - Author's abstract, condensed by V. S.

Part 3 outlines some profitable avenues of research. Appropriations should be available for the study of source rocks, the influence of fresh water on oil accumulation, the sedimentational processes and structures, etc. In the present situation, the exploratory spirit must not be sacrificed to concern about production. - V. S.

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6952. Mining and Metallurgy. Geophysical and Geological Survey of Northern Australia Nears Completion. New York, vol. 23, no. 421, 1942, p. 29.

Reporting the fact that the geophysical and geological survey of Northern Australia has now been in operation for over 6 years and covered some million square miles and has issued some 150 reports. The general operation of the survey is described wherein correlation of geological and geophysical result is brought about by close cooperation of staffs in charge of these two phases of the work of the survey. Other geophysical work of a less long-range variety than that of the survey is carried on by the New South Wales Department of Mines which deals with mining or economic problems of more immediate interest. Other details are given in the article. - D. W., Mines Mag., vol.33, no. 2, 1943.

6953. Oil and Gas Journal. A.A.P.G. Program Deals with Oil's Part in War. Tulsa, Okla., vol. 40, no. 49, 1942, pp. 23-24.

A brief presentation of the program of the 27th annual meeting of the American Association of Petroleum Geologists, jointly with the society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists, Denver, Colo., April 22-24, 1942. - D. W., Mines Mag., vol. 33, no. 4, 1943.

6954. Pirson, S. J. Oil-Supply Problem Demands Early Solution. Oil Weekly, Houston, Tex., vol. 109, no.5, 1943, pp. 51-56, 76-78.

The current rate of oil discovery by the older methods is low; yet, the demand for oil increases because of war needs. The problem is not only one of visible reserves but also of rate of productivity. Four solutions are examined: Production of synthetic oil from coal and other carbonaceous raw materials, distillation of oil from shales, increased application of secondary methods of oil recovery, and scientifically coordinated wildcatting. The greatest promise lies in the discovery of stratigraphic traps. The present geophysical methods are generally not well-suited for such discovery. Magnetic and gravimetric surveys should help the wildcatters because stratigraphic traps are not devoid of structural relations; also the reflection seismograph may be adapted. However, the greater promise lies in the new geophysical methods, such as the polarization method of Potapenko (see Abs. 101, no. 5576), the conductivity method of Evjen (see Abs. 111, no. 6780), geochemical methods, and electrical prospecting from the surface (without boreholes). The writer considers that a centralized plan and

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control of exploration should be adopted by the Government and makes suggestions. - V. S.

6955. Rosaire, E. E. A Prospecting Programme for the Dominion. Canadian Oil and Gas, Toronto, vol. 3, no. 3, 1941, pp. 3-11.

The history of prospecting for oil is traced from drilling on seeps, through geology and search for anticlines, subsurface geological methods, and finally through ordinary geophisical procedures. Each in its turn has shown diminishing returns with time, according to the author. The more recent return to a direct approach in geochemical prospecting is discussed. A program is proposed using first all known geology and grid control for soil analysis to locate significant anomalies. Further detail on these would be evaluated by carefully applied seismic reflection surveys further checked by "slim hole" confirmation. The plan suggested is admittedly unique and not a "Chinese copy" of current practice in the United States.*** The possibilities of such an exploration plan exist in Canada, as is noted, for the area has not been worked over as in the United States. In the United States new methods were introduced in succession as they developed and were recognized. A well-based article with a foreword by the editor pointing the needs and responsibilities of Canada in the war effort. - D. W., Ann. Bibl. Econ. Geol. 1941, vol. 14, no. 2, 1942.

6956. Rosaire, E. E. Prospecting Strategey in Total War Economy. Oil Weekly, Houston, Tex., vol. 104, no. 12, 1942, pp. 14-17.

A straightforward article that puts the question: Can we under stress find oil fields that are strategically located? The author discusses the many angles of this subject and makes the main point that prospectors must revise their outlook and search for oil rather than structure. The article is illustrated by examples of the inability of many branches of industry to foresee the magnitude of the present crisis and its demands, of other examples of prophets whose predictions though dire have come true in military and business affairs, and of a few heartening cases of dynamic action on the part of some manufacturers. It is held that with the proper perspective we can revise our prospecting tactics and find the necessary oil. - D. W., Mines Mag., Denver, Colo., vol. 33, no. 3, 1943.

6957. Stormont, D. H. Oil Receives Attention at Scientists Meeting. Oil and Gas Jour., Tulsa, Okla., vol. 40, no. 35, 1942, p. 19.

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Brief remarks on certain papers given at the 110th meeting of the American Association for the Advancement of Science, at Dallas, Tex., in December, 1941. Exploratory methods employed in the oil industry, geology, geophysics, and the uses of certain phases of physics were discussed by various speakers. - D. W., Mines Mag., vol. 33, no. 2, 1943.

6958. Uren, L. C. Recent Developments in Formation Logging: Rate-of-Penetration Logs, Caliper Logs, Temperature Logs, and Logging by Inspection of Drilling Fluid; Part 1. Petrol. Eng., Dallas, Tex., vol. 14, no. 5, 1943, pp. 63-70.

Drilling time indicates the rate of penetration of formations and can be made the basis of a log. Obviously, the rate of penetration depends not only on the lithological character of the formation but also on the design and condition of the bit, the circulation of the drilling fluid, the skill of the driller, etc. But most of these factors tend to become reasonably constant and do not impair the comparability of data. The best results are obtained when the bit pressure is regulated automatically. The author describes several drilling-time recording instruments. Lithologic information on the strata can be also obtained by a record of variations in the diameter of the well. In soft formations the diameter of the well is considerably larger than that of the bit; in hard formations it is but little larger than the bit. The Halliburton Oil Well Cementing Co. has developed a "caliper" instrument that measures the diameter of the hole at all depths. - V. S.

9. NEW PUBLICATIONS

6959. Bersudskii, L. D., Logachev, A. A., and Solodukho, O. Iu. A Textbook on Magnetic Surveying, Moscow, Gostoptekhizdat, L-M, 1940, 288 pp. Price, 12.00 rubles.

This textbook consists of a brief introduction and three parts. The introduction outlines the origin and development of the magnetic survey. Part I gives the physico-mathematical foundations of the survey; considerable attention is devoted to the magnetic properties of different rocks and minerals. Part II describes the apparatus and techniques of magnetic measurements, particularly the apparatus used in the U.S.S.R. Part III treats of the application of magnetic principles to geological surveys, especially to the investigation of iron-ore deposits. - V. S.

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6960. International Geodetic and Geophysical Union, Washington meeting, September 4-15, 1939, Transactions, edited by A.H.R. Goldie, in collaboration with J. W. Joyce, Internat. Geod. and Geophys. Union Bull. 11, Edinburgh, 1940, 556 pp. Price, £ 1.50.

This volume contains transactions of the International Association of Terrestrial Magnetism and Electricity, including the following articles:

Part 1, Agenda and minutes, pp. 1-68.

Part 2, National reports, pp. 69-176: Central America; Denmark - Rapport sur les travaux magnétiques, 1936-39, by D. La Cour; Egypt - Report on Work Done on Terrestrial Magnetism at Helwan Observatory during 1936-39, by M. R. Madwar; Finland - Report on Work in Terrestrial Magnetism and Electricity in 1937-39, by J. Keränen; Report Regarding Research Work at the Geophysical Observatory at Sodankylä in 1937-39, by E. Sucksdorff; France - Rapport de la Section de Magnétisme et Electricité Terrestre au Congrès de Washington (1939), by Louis Eblé; Germany - Deutscher Landesbericht, by J. Bartels; Geophysikalisches Institut, Potsdam, by J. Bartels; Deutsche Seewarte, Hamburg, Gruppe Erdmagnetismus, by F. Spiess; Erdmagnetisches Observatorium, Fürstenfeldbruck (Oberbayern), by F. Burmeister; Erdmagnetisches Observatorium, Wien-Auhof, by M. Toperczer; Geophysikalische Warte in Königsberg Pr., by H. Lettau; Kommission zur geophysikalischen Reichsaufnahme, by O. Barsch; Geophysikalisches Observatorium am Collmberg bei Oschatz, by L. Weickmann; Oberschlesische erdwissenschaftliche Landeswarte in Ratibor, by K. Mainka; Great Britain - Report of the British National Committee, 1936-39; Holland - Rapport sur les travaux magnétiques, 1936-39, by G. van Dijk; Hungary - Bericht über das Kön. Ung. meteorologische und erdmagnetische Observatorium zu Ógyalla, by A. Réthly; Japan - Observations of Terrestrial Magnetism, Atmospheric Electricity, and Earth Current at the Magnetic Observatories in Kakioka and Toyohara, Japan, by T. Okada; Morocco - Rapport sur les travaux de la section de Magnétisme et Electricité Terrestres depuis la Réunion d'Edinbourg de l'U.G.G.I., by J. Debrach; Poland - Travaux de l'Observatoire Geophysique de Świder, by St. Kalinowski; South Africa - Progress of Work in Terrestrial Magnetism, by A. Ogg; Sweden - Report on Work in Terrestrial Magnetism and Atmospheric Electricity Since the Edinburgh Assembly, by Harald Norinder; Special Reports, by Hannes Alfvén, F. Lindholm, Gustaf S. Ljungdahl, Kurt Molin, H. Norinder, J. Östman; Appendix; United States - Report of the Section of Terrestrial Magnetism and Electricity of the American Geophysical Union, 1936-39, by J. W. Joyce; Preliminary Report on Magnetic and Electrical Laboratories in New Geophysics Building, Colorado School of Mines, by C. A. Heiland; Progress of Work in Terrestrial

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Magnetism of the United States Coast and Geodetic Survey, July 1, 1936-June 30, 1939, by N. H. Heck; Report by the Department of Terrestrial Magnetism, Carnegie Institution of Washington, to the Washington Assembly on Work Done Since the Edinburgh Assembly, by J. A. Fleming; U.S.S.R. - Report on Work in Terrestrial Magnetism and Electricity during 1936-39, by P. P. Lazarev, N. I. Leuschin, N. N. Nikolsky, N. V. Pushkov, and N. N. Trubyatchinsky.

Part 3, Special reports, pp. 177-318: (1) Rapport sur la publication du caractère magnétique de chaque jour, by G. van Dijk; (2) Rapport sur la publication du caractère magnétique numérique des jours, by G. van Dijk; (3) Rapport sur la publication des caractères magnétiques pendant l'année polaire 1932-33, by G. van Dijk; (4) Report on International Magnetic Classification of Greenwich Days Prior to 1906, by G. van Dijk; (5) Bestimmung täglicher internationaler erdmagnetischer Charakterzahlen für Jahre vor 1890, by J. Bartels; (6) Report of Committee to Consider Existing and Desirable Distribution of Magnetic and Electric Observatories and the Better Coordination of Work and Publications of Existing Observatories; (7) Report of the Auroral Committee, by Carl Störmer; Addendum to Report to the Auroral Committee; Appendix, by C. Störmer; (8) Report of Committee for Study of Relations between Solar Activity and Terrestrial Magnetism; (9) Report of Special Committee on Magnetic Secular Variation; Appendices; (10) Report of the Committee for the Electrical Characterization of Days, by O. H. Gish; Appendix; (11) Electric Characterization of Days Used in Connection with Publication of Atmospheric-Electric Data from Watheroo and Huancayo, by J. A. Fleming; (12) Report of the Committee on Magnetic Charts (Organization of the Work), by H. Spencer Jones; (13) Report of the Committee on the Methodology of Magnetic Charts, by J. Keränen; (14) Report of the Committee on Registration in Iceland of Giant Pulsations; Commission relative au mode de publication des observations magnétiques, rapport du president; (15) Report of Committee on Classification of Magnetic Literature, by H. D. Harrandon; Appendix: An Extension of the Dewey Decimal Classification for Terrestrial Magnetism, by D. G. Knapp; (16) Report of Committee to Promote International Comparisons of Magnetic Standards, by D. La Cour; (17) Progress Report of the Joint Committee to Describe Magnetic Disturbances, by J. A. Fleming; (18) Joint Committee with International Scientific Radio Union, by E. V. Appleton and L. V. Berkner; (19) Report on Moon's Effect upon Geophysical Phenomena, by S. Chapman; (20) Report on Possible Errors in Connection with the Use of Ion-Counters, by G. R. Wait; (21) Report on the Activity of the Polar Year Commission, by D. La Cour; (22) Report on Photographic Reproduction of Records, by D. La Cour; (23) List of Registerings, Observations, Photographs and Discussions Regarding Magnetism, Earth-Current, Cosmic Radiation, and Aurora, Collected for the Use of Investigators;

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(24) Provisional Report of the Statistical Study on the Diurnal Variations of Terrestrial Magnetism in the North Polar Regions, by M. Hasegawa.

Part 4, Communications, pp. 319-531: A. Terrestrial Magnetism. (1) The Influence of the Surrounding Air upon the Time of Vibration of a Magnet, by J. Veldkamp; (2) Etude Comparative en divers points du globe de la variation diurne de la declinaison cycle undécennal, by M. et Mme. Labrouste; (3) On Prediction and Mutual Correlation of the Maps of Distribution of Magnetic Elements and Their Annual Changes, by B. P. Weinberg; (4) A Design for a Traveling Electromagnetic Standard, by E. A. Johnson; (5) Measurement of Susceptibility of Materials Used in Magnetometers, by E. A. Johnson & W. F. Steiner; (6) Determination of the Secular Variation in Declination in New England from Magnetic Polarization of Glacial Varves, by A. G. McNish and H. F. Johnson; (7) Various Hypotheses Regarding the Origin and Maintenance of the Earth's magnetic field, by E. H. Vestine, M. A. Tuve, and E. A. Johnson; (8) The Disturbance-Field of Magnetic Storms, by E. H. Vestine; (9) The Potential of the Earth's Magnetic Secular Variation, by E. H. Vestine; (10) Sur le lien entre les phénomènes solaires et magnétiques, by J. Coulomb; (11) Improvements in Methods of Field-Observations in the United States of America, by J. W. Joyce and H. F. McComb; (12) Improvements in Technique at Magnetic Observatories in the United States of America, by H. E. McComb and J. W. Joyce; (13) International Magnetic Classification for Years Prior to 1890, by G. van Dijk; (14) Auroral Work in Southern Norway in the Year 1938, by Carl Störmer. B. Ionosphere. Cosmic Radiation. (1) L'étude des evanouissements brusques des ondes radioélectriques courtes, by R. Jouaust; (2) Observatory Technique of Ionospheric Measurements, by L. V. Berkner; (3) Ionospheric Effects Associated with Magnetic Disturbances, by L. V. Berkner, H. W. Wells and S. L. Seaton; (4) On the 27-day and 13.5-day Waves in Cosmic-Ray Intensity and Their Relation to Corresponding Waves in Terrestrial-Magnetic Activity, by S. E. Forbush; (5) Results of Continuous Multifrequency Ionospheric Recordings at the Huancayo Magnetic Observatory, Peru, December 1937 to December 1938, by H. W. Wells and H. E. Stanton; (6) The Ionospher, by E. O. Hulburt; (7) Nonseasonal Behaviour of the F-region, by S. L. Seaton and L. V. Berkner; (8) Tables of Sunspot-Frequency for 1749-1938, by W. Brunner. C. Atmospheric and Terrestrial Electricity. (1) Le rôle de la radioactivité dans les roches, by E. Rothé; (2) Mesures comparatives de la conductibilité de l'air, by W. Smosarski; (3) Nouveaux types de compteur d'ions atmosphériques pour la détermination directe du spectre de mobilités, by P. Queney; (4) Densities of Condensation-Nuclei over the North Atlantic Ocean, by F. T. Davies and G. R. Wait; (5) Need for Measurements to Supplement Observations of Potential-Gradient and of Conductivity at Atmospheric-Electric

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Observatories, by O. W. Torreson and G. R. Wait; (6) The Application of Telluric Currents to Surface Prospecting, by Marcel Schlumberger; (7) Variation of Earth-Current Activity with the Sunspot-Cycle, by W. J. Rooney. D. Joint Discussions with the Association of Meteorology. (1) Recent Progress in the Investigation of Thunderstorms, by F. J. W. Whipple; (2) Meteorological Aspects of Thunderstorm Electricity, by H. R. Byers; (3) Ionic Equilibrium in the Troposphere and Lower Stratosphere, by O. H. Gish and K. L. Sherman; (4) Some Meteorological Effects and Their Relation to the Electrical Condition of the Lower Atmosphere, by G. R. Wait and C. W. Torreson; (5) The Electrical and Meteorological Development of Thunderstorms, by E. J. Workman and R. E. Holzer; (6) The Origin and Types of Discharges in Thunderstorms, by R. E. Holzer and E. J. Workman; (7) The Density of the Upper Atmosphere from Photographic Meteors, by Fred L. Whipple; (8) Problems of Upper Atmospheric Physics, by L. V. Berkner; (9) Relation Between Actual and Virtual Ionospheric Height, by H. G. Booker and S. L. Seaton; (10) Some Recent Ionospheric Researches, by E. V. Appleton; (11) Recombination and Attachment Processes in the Ionosphere, by H. S. W. Massey; (12) Dissipative Processes for Electrons in the Ionosphere, by E. V. Appleton; (13) Problems of the Intermediate Atmosphere, by E. O. Hulburt, E. A. Johnson, and M. A. Tuve; (14) Suggested Lines for Further Investigations of Upper-Air Physics, by J. A. Fleming.

Part 5, Proposals on Various Subjects, pp. 532-549; (1) Accurate Determinations of the Magnetic Declination and Inclination, by J. Egedal; (2) Central Bureau for Magnetic Data, Proposal by Professor Errulat; (3) Palaeomagnetic Investigations, by J. A. Fleming, E. A. Johnson, and A. G. McNish; (4) Contribution à la recherche de la variation séculaire du champ magnétique terrestre, by E. Thellier; (5) First Report on Coordinated Study of Volcanic Phenomena at Santa Maria: Initial Geomagnetic Work, by A. G. McNish; (6) First Report on Coordinated Study of Volcanic Phenomena at Santa Maria: Initial Geoelectric Work, by C. H. Gish; (7) A propos de résistivité en prospection électrique: une pratique à rejeter, by P.-L. Mercanton; (8) A Possible Method of Measuring the Effect of Particle Emission on the Earth;s Magnetic Field, by E. A. Johnson; (9) Importance of the Development of New Observational Technique for Land Magnetic Measurements, by E. A. Eckhardt.

Part 6, Resolutions, Committees, and Reporters, pp. 550-556: A. Resolutions of the Association; B. Executive Committee; C. Committees; D. Reporters.

6961. Jakosky, J. J., Dreyer, R. M., and Wilson, C. H. Geophysical Investigations in the Tri-State Zinc and Lead Mining District. University of Kansas Publications, a

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Joint Publication of State Geological Survey of Kansas, Bulletin 44, and Engineering Experiment Station, Bulletin 24, December 1942, 151 pp.

A brief review appeared in the Bull. Am. Assoc. Petrol. Geol., vol. 21, no. 1, 1943 (see Abs. 112, no. 6823). Jakosky gives a more complete summary in Geophysics, vol. 8, no. 2, 1943, pp. 177-178. - V. S.

6962. Pollard, Ernest, and Davidson, W. L., Jr. Applied Nuclear Physics, 249 pp., illus., New York, John Wiley and Sons, Inc., London, Chapman and Hall, Ltd., 1942. Price, $3.00.

The geophysicists interested in radioactivity will find in this book the technical aspects of nuclear physics. The author describes and explains the essential facts and methods of artificial radioactivity and transmutation. He aims to be of service to technical specialists who, though not versed in the language of physics, use the products of nuclear physics in their own fields. The chapters cover Radioactivity, Technique in Artificial Radioactivity, Artificial Radioactivity in Practice, Stable Isotopes and Their Application, and other topics. The text includes summarized tables on radioactive elements. - V. S.

6963. Rosaire, E. E. Handbook of Geochemical Prospecting. Subterrex, Houston, Tex., 1939, 60 pp. Supplements 1-2, 1940, pp. 62-113.

The Subterrex Co. has added two supplements to the Handbook proper (see Abs. 102, no. 5703) describing developments in geochemical prospecting: (1) Geochemical Well Logging covers individual logs for hydrogen, total hydrocarbons, methane, gas hydrocarbons (methane through butane), distillate Hydrocarbons (pentane through about decane), sand, carbonates, sulfates, and halides (undifferentiated chlorides, bromides, and iodides); a dry-hole technique by the analysis of file samples from abandoned wildcat tests is also outlined; and (2) the Geoelectrical Recognition of Inorganic Geochemical Anomalies centers about Eltran prospecting for geochemical anomalies, a modification of L. W. Blau's electrical transient method. Eltran is based on the physical measurement of the bulk sedimentary properties and is suited for rapid, quantitative, low-cost reconnaissance. Eltran data clarify reflection problems by differentiating between symmetrical and annular secondary carbonate types of deposition. - V. S.

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10. PATENTS

6964. Side Wall Sampler; P. T. Bynum, Beeville, Tex.: U.S. Patent 2,299,078, issued October 20, 1942.

A side-wall sampler including a housing having a body, a trigger carried by the body, a plunger within the body, means normally urging the plunger downwardly within the body, means carried by the plunger and engageable with the trigger for retaining said plunger against the tension of the last-mentioned means, and a sampling tube carried by the plunger and movable laterally upon release of the trigger and consequent downward movement of the plunger and upward rush of fluid in the plunger to engage side wall for a sampling operation. - Claims allowed, 8.

6965. Vibration Measuring Apparatus; C. S. Draper, Newton, Mass., assignor to Research Corporation, New York, N. Y., a corporation of New York: U. S. Patent 2,299,081, issued October 20, 1942.

A means for converting energy of vibratory angular motion about a given axis into electric energy, comprising, in combination, a shaft rigidly connected to the vibrating structure, a balanced mass mounted on bearings coaxially with said shaft and restrained to rotate with the mean angular velocity of said shaft by springs disposed between said mass and said shaft, magnet means secured to said mass having magnet poles symmetrically disposed on either side of the axis of said shaft and mass, an armature of material having a magnetic permeability high compared to that of air secured to said shaft, said armature having a recess, a coil mounted on said armature in said recess and electrically insulated from the armature, said armature and coil being so disposed between poles of said magnet that relative motion between said mass and said armature causes a transfer of flux from a portion of said armature on one side of said recess to a portion on the other side, thereby resulting in a change of flux through said coil and generating an induced voltage substantially proportional to the velocity of relative motion between said mass and said armature, said voltage being therefore substantially proportional to the vibratory angular motion of this shaft above a certain frequency - Claims allowed, 7.

6966. Explosive Charge for Oil Wells; W. E. Lawson, Woodbury, N. J., and C. A. Woodbury, Media, Pa., assignors to E. I. du Pont de Nemours and Co., Wilmington, Del., a corporation of Delaware: U. S. Patent 2,299,907, issued October 27, 1942.

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An explosive charge adapted for use in wells, comprising a water soluble inorganic salt, dispersed in a liquid explosive nitric ester present as a continuous flowable liquid phase, said charge being free from absorbents, the entire composition being in flowable form. - Claims allowed, 13.

6967. Testing Well; J. B. Clark, Tulsa, Okla., Assignor to Stanolind Oil and Gas Company, Tulsa, Okla., a corporation of Delaware: U. S. Patent 2,300,206, issued October 27, 1942.

A method of determining the location of the lowermost point of water entry into a well comprising the steps of displacing the well fluids in said well to a point above said lowermost point by a high resistivity liquid the specific gravity of which exceeds that of the water in said well, and which is substantially immiscible with said well fluids, causing water from a permeable formation to flow into said well whereby an interface is produced in the column of fluid in said well substantially at said boundary, and thereafter determining the location of said interface. - Claims allowed, 15.

6968. Oscillograph; Eberhard Steudel and Josef Kaspar, Berlin, Germany, assignors to General Electric Co., a corporation of New York: U. S. Patent 2,301,826, issued November 10, 1942.

A stereoscopic oscillograph for simultaneously observing four cathode-ray-tube image screens upon which separate and different oscillographic traces are produced, including semi-transparent elements for viewing the image screens in pairs, said elements being so arranged that when viewed through each said element the screens of the respective screen pair appear superimposed, and means including light transmitting stereoscopic lenses whereby both screen pairs when viewed through said lenses appear at the same place and whereby the four separate and distinct oscillographic traces will appear as present on a single screen. - Claims allowed, 1.

6969. Accelerometer; J. A. Buchanan, U. S. Navy: U. S. Patent 2,302,670, issued November 24, 1942.

A device adapted for use in ascertaining acceleration imparted thereto, said device including an element movable in response to acceleration comprising a multicompartment shell, each said compartment containing a mass free to move therein to develop internal damping. - Claims allowed, 6.

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6970. Gun Perforator; A. J. Holifield, Mobile, Ala., assignor of one-fourth to E. H. Planck, and one-half to M. H. Dees, both of Mobile, Ala.: U. S. Patent 2,304,408, issued December 8, 1942.

A gun perforator comprising a body member having a plurality of cartridge chamber, plunger-operated firing pins associated with the cartridge chambers, means for normally holding the plunger in inoperative position, and hydraulic means adapted to communicate with a drill pipe for moving the plunger to operative position. - Claims allowed, 10.

6971. Timing Device; J. D. Eisler, Tulsa, Okla., assignor to Stanolind Oil & Gas Co., Tulsa, Okla., a corporation of Delaware: U. S. Patent 2,304,901, issued December 15, 1942

In an apparatus for recording timing indications on a photosensitive medium, the improvement which comprises means for directing a beam of light toward said photosensitive medium, a first member mounted to oscillate at a constant frequency, an oscillating light mask associated with said first member and arranged to oscillate about an axis substantially parallel to said beam of light at a constant frequency different than the frequency of said first member, the ratio of said frequencies being a small whole number greater than one, said oscillating light mask and said first member being further arranged such that for small motions of the first oscillating member the path of the portion of the light mask interrupting the light beam is perpendicular to the path of motion of the first oscillating member. - Claims allowed, 8.

6972. Firing Means for Well Perforating Guns; A. J. Collins, Corpus Christi, Tex.: U. S. Patent 2,305,139, issued December 15, 1942.

In a well gun-firing device, the combination of a gun barrel, a support having means for connecting with said gun barrel and provided with a chamber, a primary firing element movably disposed between the gun barrel and the chamber of said support, an actuating member movable in the chamber of said support, means for holding said member elevated above said firing element, means for running said device in a well bore, means set to operate from the top of the well for releasing said holding means and firing said member when said running means is rotated, and means normally under tensioned restraint for impelling said member into firing engagement with said firing element. - Claims allowed, 12.

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6973. Electrical Terminal; R. E. Fearon, Tulsa, Okla., assignor to Well Surveys, Incorporated, Tulsa, Okla., a corporation of Delaware: U. S. Patent 2,305,150, issued December 15, 1942.

An electrical lead-in assembly comprising a body formed of material having a substantially negligible coefficient of thermal expansion and, integrally cast therein and extending therethrough, a continuous electrical conductor of irregular longitudinal cross-sectional outline, said conductor having an appreciable thermal expansion coefficient. - Claims allowed, 4.

6974. Vibration Measuring Apparatus; E. E. Minor, Baltimore, and S. A. Kilpatrick, Raspeburg, Md., assignors to the Glenn L. Martin Co., Baltimore Md.: U. S. Patent 2,305,267, issued December 15, 1942.

A pick-up device for inductively producing electric currents in response to accelerations of a vibrating body comprising three metallic rings coaxially alined and including a center ring and two outer rings, two spring disks initially strained in opposite directions and each extending between said center ring and an outer ring, a metallic mass held by and between said disks, said mass being movable with respect to said rings, two coils each of which being mounted in an outer ring, and means for holding said rings, mass, disks, and coils in assembled position. - Claims allowed, 9.

6975. Earth Boring Device; A. H. Graham, Dallas, Tex., assignor to Socony-Vacuum Oil Co., Inc., New York, N. Y., a corporation of New York: U. S. Patent 2,306,118, issued December 22, 1942.

A boring head for earth boring implements comprising a casing, in said casing a shaft, an auger mounted upon the lower end of said shaft having a cutting flight extending axially beyond said casing and having a diameter at least as great as the external diameter of said casing, rearward flights of said auger within said casing being of less diameter than the internal diameter of said casing and bearing means internal of said casing adjacent its end to cooperate with the peripheral edge of said rearward flights to hold the shaft and auger centered in said casing, and conveyor flights greater in diameter than said rearward flights and having a pitch different from the rearward flights to facilitate removal of cuttings produced by the rotation of the auger. - Claims allowed, 2.

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6976. Measuring and Recording Apparatus; Mayne, W. H., San Antonio, Tex., assignor to Olive S. Petty, San Antonio, Tex.: U. S. Patent 2,306,456, issued December 29, 1942.

In apparatus for use in seismic surveying in conjunction with at least two seismometers disposed at spaced points, the combination with a pair of thermionic valves, each of said valves having operating characteristics such that the upper portion of the E_g-I_p curve thereof is generally parabolic and being biased for operation substantially at the vertex of said curve, of means for supplying to said valves wave-form energy from said seismometers, and indicating means operable by the output of said valves. - Claims allowed, 6.

6977. Measuring and Recording Apparatus; Mayne, W. H., San Antonio, Tex., assignor to Olive S. Petty, San Antonio, Tex.: U. S. Patent 2,306,457, issued December 29, 1942.

In apparatus for use in seismic surveying, the combination with a seismometer for converting seismic energy into electrical wave form energy, of means for amplifying and recording said wave form energy, said last named means including a thermionic valve having a cathode, an anode, and at least three grids, means applying a negative bias voltage to the first and third grids and a high voltage to the intermediate grid, means for connecting said anode and cathode, and means delivering a control voltage to one of said negatively biased grids, the applied voltages being such as to cause the anode current-grid voltage relation to vary substantially as a parabola through and beyond the parabolic vertex and to establish the static operating point substantially at the parabolic vertex, whereby the anode current varies as the square of the control voltage, and means for deriving from said anode current an alternating voltage having a frequency twice that of the control voltage. - Claims allowed, 10.

6978. Measuring and Recording Apparatus; Mayne, W. H., San Antonio, Tex., assignor to Olive S. Petty, San Antonio, Tex.: U. S. Patent 2,306,458, issued December 29, 1942.

In apparatus for use in seismic surveying, the combination with a seismometer for converting seismic energy into electrical wave form energy, of means for amplifying and recording said wave form energy, said recording means including an energy squaring device, said device including a recording oscillograph of the electro-dynamometer type having fixed and movable coils, and means energizing both of said coils with said wave form energy. - Claims allowed, 1.

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6979. Automatic Volume Control; G. M. Groenendyke, Dallas, Tex., assignor, by mesne assignments, to Socony-Vacuum Oil Co., Inc., New York, N. Y., a corporation of New York: U. S. Patent 2,306,991, issued December 29, 1942.

In an electric seismograph comprising means for detecting seismic waves by generating electrical signals in sympathy with them, thermionic means for amplifying said electrical signals, means for recording the amplified signals on a standard width strip in the form of a seismogram, an automatic volume control for said amplifier whose operation is initiated by the electrical signals, said automatic volume control comprising common thermionic means for both amplifying and rectifying the electrical signals, a resistance in the plate circuit of said thermionic means, energy storage means connected in parallel with said resistance whereby the IR drop across said resistance will serve as a charging voltage for said energy-storage means, a second energy-storage means connected in such relation to said first-energy storage means that it will not receive any substantial energy until the first storage means has become substantially fully charged, and means for communicating the charged potential of the second-energy storage means to the control grid of at least one vacuum tube in the thermionic amplifier to effect control of the gain in amplification as derived from that tube. - Claims allowed, 2.

6980. Seismic Exploration System; Herbert Hoover, Jr., Sierra Madre, Calif., assignor to Consolidated Engineering Corporation, Pasadena, Calif., a corporation of California: U. S. Patent 2,307,791, issued January 12, 1943.

In a seismic prospecting system for measuring relative times of seismic wave arrival at spaced points, including a plurality of seismic wave receptors in contact with the ground at varying distances from a source of seismic waves, a plurality of substantially identical amplifiers having their inputs connected to different receptors, a trace recorder connected to the output of each amplifier and recording the waves received at said receptors as traces having a common time coordinate, the combination which comprises a single common voltage source connected to similar elements of each amplifier, each of the connections from the voltage source to the respective elements including means to attenuate waves within the frequency range of waves to be amplified by the respective amplifiers and recorded as related traces to be directly compared, whereby undesired crossfeed between amplifiers through the common voltage source and timing errors arising from such crossfeed are prevented. - Claims allowed, 2.

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6981. Seismometer; Herbert Hoover, Jr., Sierra Madre, Calif., assignor to Consolidated Engineering Corporation, Pasadena, Calif., a corporation of California: U. S. Patent 2,307,792, issued January 12, 1943.

Apparatus for seismic surveying comprising a seismometer having opposite ground contact surfaces of differing contour and having substantially equal sensitivity in either of two opposite planting orientations assumed by said seismometer when one of said surfaces is in contact with the ground and beneath the other, a seismic wave amplifier connected to said seismometer, a reproducer connected to the output of said amplifier, and means for inverting the sense of signals passing through said connections in accordance with seismometer orientation to provide the same sense relationship of the reproduced wave to the received earth motion irrespective of the seismometer planting orientation in use at the time of the wave reception. - Claims allowed, 4.

6982. Gravity Meter; D. H. Clewell, Dallas, Tex., assignor, by mesne assignments, to Socony-Vacuum Oil Co., Inc., New York, N. Y., a corporation of New York: U. S. Patent 2,307,917, issued January 12, 1943.

An instrument for geophysical prospecting that provides means for measuring the force of gravity or variations of the force of gravity over a given area, that comprises a support, a pair of masses, resilient means for securing the masses to opposite sides of the support so that the masses are held in equilibrium with the force of gravity and are free to move about the equilibrium point in short, slightly convergent, substantially vertical paths, a substantially horizontal tension member connected to the two masses and attracting one toward the other with a force sufficient to introduce a negative stiffness factor that nearly cancels the positive stiffness of said resilient means and thereby introduces a high sensitivity of the system to changes in the force of gravity, and means indicative of position of at least one of the masses. - Claims allowed, 5.

6983. Operations in Boreholes; L. G. Howell, Houston, Tex., assignor to Standard Oil Development Co., a corporation of Delaware: U. S. Patent 2,308,176, issued January 12, 1943.

In an operation conducted in a borehole in which at least two extraneous materials are placed in the borehole and it is desired to determine the position which such materials assume in the borehole, the steps of adding to each such material

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before introducing it into the borehole a radioactive material of relatively short life, the life of said radioactive material being different for each such extraneous material, placing said materials in the borehole, producing a radioactive well log of said borehole during the life of the shortest lived radioactive material, and producing a second radioactive log of said borehole after the termination of the life of the shortest lived radioactive material whereby the location of the extraneous material containing the shortest lived radioactive material can be determined by comparison of said logs. - Claims allowed, 2.

6984. Well Logging Method and Device; R. E. Fearon, Tulsa, Okla., assignor, by mesne assignments, to Well Surveys, Inc.: U. S. Patent 2,309,301, issued January 12, 1943.

The method of determining the nature of formations penetrated by a drill hole which comprises inserting in the drill hole a neutron-emitting source and measuring the radiations from the formations as influenced by said neutron-emitting source, by impressing an electrical potential on an ionizable medium of relatively high density and exposing said ionizable medium to the radiations intercepting said drill hole whereby ionization of said ionizable medium is caused and electrical current permitted to flow and measuring the magnitude of the current. - Claims allowed, 3.

6985. Apparatus for Detecting and Exhibiting Explosions in Wells; O. F. Ritzmann, Aspinwall, Pa., assignor to Gulf Research & Development Co., Pittsburgh, Pa., a corporation of Delaware: U. S. Patent 2,308,390, issued January 12, 1943.

An apparatus for exhibiting occurrence of explosions created in a bore, in regions subject to extraneous vibrations comprising, in combination with a seismic wave detector, means including an adjustable-gain amplifier for exhibiting the magnitude of extraneous terrestrial vibrations, a critical-level trip circuit egergized by said amplifier in response to terrestrial vibrations above a selected level, energy exhibiting means in said trip circuit, and means for adjusting the critical energy level of the exhibiting means. - Claims allowed, 3.

6986. Well Logging Winch Truck; E. H. Olmstead, Tulsa, Okla., assignor to Well Surveys, Inc., Tulsa, Okla. a corporation of Delaware: U. S. Patent 2,309,004, issued January 12, 1943.

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In a winch truck of the type employed in oil well logging for receiving the electrical cable used in suspending the logging instrument including a chassis mounted on wheels connected through a drive shaft with a prime mover, the improvements which comprise a cable receiving winch transversely mounted adjacent the rear of the chassis, a cable-guiding traversing means mounted near and cooperating with the winch for facilitating uniform distribution of cable during winding upon the winch, a smoothly continuously variable fluid-power transmitting means coupling the winch to the prime mover, said means comprising a hydraulic motor connected to the winch for driving the same, a variable stroke pump driven by the prime mover for operating the motor whereby alteration of the pump stroke causes change in the rate of operation of the motor, and a remote control for altering the stroke of said pump whereby the rate of operation of the motor can be adjusted from a location distant from the truck. - Claims allowed, 1.

6987. Method of Making Geophysical Explorations; L. F. Athy, Ponca City, Okla., and E. V. McCollum, Houston, Tex., assignors to Continental Oil Co., Ponca City, Okla., a corporation of Delaware: U. S. Patent 2,309,817, issued February 2, 1943.

A method of profiling tectonic structure including the steps of generating seismic waves at a point near the earth's surface, recording the time of travel of reflected waves from the generating point to the subsurface strata and back to a plurality of points on the surface located at a predetermined distance from the generating point, computing the velocity of travel vertically at the generating point of the reflected seismic waves from the recorded data at the plurality of receiving points. - Claims allowed, 7.

6988. Well Logging Apparatus and Method thereof; R. E. Fearon, Tulsa, Okla., assignor to Well Surveys, Inc., Tulsa, Okla., a corporation of Delaware: U. S. Patent 2,309,835, issued February 2, 1943.

A geophysical prospecting device that comprises a radiation detector, a well casing perforator, and an electrical circuit including both the detector and the perforator capable of simultaneously receiving signals from the former and operating the latter by means of electrical currents having different operating characteristics. - Claims allowed, 11.

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6989. Geochemical Prospecting; Leo Horvitz, Houston, Tex., assignor to Esme E. Rosaire, Houston, Tex.: U. S. Patent 2,310,291, issued February 9, 1943.

The method of geochemical prospecting for deposits the leakage components of which are of a reducing nature comprising collecting earth samples at spaced points in a region to be explored, analyzing such samples for those ions of a polyvalent element the -ic oxide of which is reducible by hydrocarbon gases present in lower states of valence, and correlating the value determined with sample locations, whereby information indicative of the presence of such deposits is obtained. - Claims allowed, 14.

6990. Geochemical Prospecting; E. E. Rosaire, Houston, Tex.: U. S. Patent 2,310,318, issued February 9, 1943.

In geochemical prospecting in which samples of soil are collected for the purpose of recovering therefrom a gas to be analyzed for significant constituents the step of subjecting the soil samples immediately upon recovery to such substantially reduced temperature that such constituents as are otherwise subject to loss at ordinary temperatures are retained in the samples and holding the samples at this reduced temperature until they are subjected to a treatment for the recovery therefrom of the gas to be analyzed. - Claims allowed, 3.

6991. Electrical Exploration of Geological Strata; E. E. Blondeau, Tulsa, Okla., assignor to Geophysical Research Corporation, New York, a corporation of New Jersey: U. S. Patent 2,310,611, issued February 9, 1943.

In exploration of geological formations traversed by a borehole of the type bored by a drill stem terminating in a bit, the method of electrical exploration which comprises establishing a difference of electrical potential between said bit and said drill stem, and observing the potential produced at the earth's surface between two spaced grounded electrodes, at least one of which is remote from said drill stem, and observing said potential difference. - Claims allowed, 9.

6992. Analysis of Soil Samples for Determining Oil Content; J. G. Campbell, Houston, Tex., assignor to R. H. Fash, trustee, Fort Worth, Tex.: U. S. Patent 2,311,151, issued February 16, 1943.

A method for use in exploring for petroleum oil, which consists in preparing an extract by treating an earth sample

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with an oil solvent to extract from said sample any petroleum oil contained therein, subjecting the extract to ultraviolet light to produce a fluorescent effect of an intensity proportional to the amount of oil contained in the extract, measuring the intensity of said fluorescent effect to obtain a quantitative determination of the amount of oil in the earth sample, and in adjusting the result thus obtained as to oil content to express the result as an amount of oil per unit area, to thereby compensate for variations in the surface area of the earth particles comprising the sample. - Claims allowed, 9.

6993. Thermometric Method and Apparatus for Exploration of Boreholes: J. J. Jakosky, Los Angeles, Calif., assignor to Schlumberger Well Surveying Corporation, Houston, Tex., a corporation of Delaware: U. S. Patent 2,311,757, issued February 23, 1943.

The method of determining the geologic nature and characteristics of a geologic formation traversed by a borehole, which comprises: moving a source of heat longitudinally through the borehole to supply heat at successively different depths therein, and successively obtaining indications of the difference in temperature between an unheated portion of the borehole located at a fixed longitudinal distance in advance of said heat source, said distance being such that the temperature of said unheated portion is not influenced appreciably by the heat supplied by said heat source, and a heated portion of the borehole located a fixed longitudinally distance behind said heat source, whereby the geologic nature and characteristics of the geologic formation traversed by the borehole may be determined from the data so obtained. - Claims allowed, 4.

6994. Method of Locating Subterranean Petroleum Deposits; R. O. Smith, Fort Worth, Tex.: U. S. Patent 2,312,271, issued February 23, 1943.

In the art of exploration for underground hydrocarbon deposits, the steps which comprise systematically collecting a series of samples of surface soil at spaced locations, extracting said samples separately with an organic solvent for solid, petroleum-derived constituents present initially in said samples in soluble form, and measuring the relative amounts of said constituents thus extracted whereby said underground hydrocarbon deposits can be located. - Claims allowed, 2.

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6995. Seismic Exploration Method; A. J. Herzenberg, Houston, Tex., assignor to Shell Development Co., San Francisco, Calif., a corporation of Delaware: U. S. Patent 2,312,642, issued March 2, 1943.

In a seismograph system comprising a plurality of detectors adapted to generate electric impulses and a multistring recorder adapted to record said impulses, a plurality of closed circuits for the transmission of said impulses from the detector to the recorder, each of said circuits comprising an input transformer inductively linking said circuit to a detector and an output transformer inductively linking said circuit to one of the strings of the recorder, a nonlinear resistance element shunting said circuit between said transformers, means in circuit with at least one detector to produce a direct current varying as a function of the amplitude of the impulses generated by said detector, and single control means for passing said variable direct current through said nonlinear resistance elements in series, whereby the energy of the impulses transmitted in each of said circuits from the input transformer to the output transformer is varied as a function of the intensity of said direct current. - Claims allowed, 6.

6996. Gain Control for Seismograph Amplifiers; E. M. Shook, Dallas, Tex., assignor, by mesne assignments, to Socony-Vacuum Oil Co., Inc., New York, N. Y., a corporation of New York: U. S. Patent 2,312,934, issued March 2, 1943.

In a seismograph circuit comprising a seismometer, an electrical amplifier and a recorder, the improvement that comprises a control circuit for controlling the degree of amplification of the amplifier, said control circuit including: a primary control circuit for the amplifier adapted to normally maintain the amplifier at a relatively high degree of amplification, said primary control circuit being a means for maintaining a bias on the grid of at least one thermionic tube in the amplifier; a secondary control circuit including a source of potential, a condenser, a means for applying said potential through said condenser across a resistance in said primary control circuit in such a manner that the secondary control circuit, if acting alone, would instantaneously cause the primary control circuit to reduce the degree of amplification of the amplifier to a relatively low degree and gradually allow the primary control circuit to return the amplifier to its normal high degree of amplification; and a third control circuit including a condenser and a resistor connected in series across the condenser in the secondary control circuit and the resistance in the primary control circuit so as to delay the application of potential across said first mentioned condenser and resistance and thus delay the reduction in amplification and cause it to take place gradually. - Claims allowed, 1.

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6997. Seismic Recording; D. S. Renner, Dallas, Tex., assignor to Geophysical Service Inc., a corporation of Delaware: U. S. Patent 2,313,091, issued March 9, 1943.

In the art of seismic prospecting the method comprising the steps of creating elastic waves in the earth, recording the instant of creation of the waves and the waves transmitted through the earth to a point in spaced relation with the wave source, and simultaneously recording a numerical chart of time of the seismic event such chart having a predetermined relation with a definite phase of the event. - Claims allowed, 8.

6998. Well-Bore Radiation Logging Apparatus; J. C. Arnold, Los Angeles, Calif., assignor to Lane-Wells Co., Los Angeles, Calif., a corporation of Delaware: U. S. Patent 2,313,310, issued March 9, 1943.

A well logging apparatus comprising: a device sensitive to sub-atomic bombardment from the formation confronting the wellbore, said device including an element adapted to move in response to such bombardment; a recording camera having a predetermined exposure time interval and located in close proximity to said device and element for photographing the movement of said element; and means for correlating the record of said camera in terms of well depth. - Claims allowed, 19.

6999. Means for Determining the Tectonics and Nature of Subsurface Geology; R. E. Lee, Coleman, Tex., assignor, by mesne assignments, to J. H. Reynolds: U. S. Patent 2,313,384, issued March 9, 1943.

An apparatus for geophysical exploration including a housing adapted to be connected in a drill stem, means carried by the housing for setting up an electrical field within the media surrounding said housing, a receiver at the surface, and means mounted on the housing effected by the electrical field and connected with the receiver for indicating the physical distortion of the electrical field pattern as caused by the nature and characteristics of the formation. - Claims allowed, 5.

7000. Method for Making Geophysical Surveys; S. R. Phelan, Memphis, Tenn.: U. S. Patent 2,314,597, issued March 23, 1943.

A method of geophysically exploring subsurface earth structures, which includes establishing three widely spaced electrodes and a source of current; connecting a pair of said

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electrodes, to one pole of said source, and one said electrode, spaced from said pair, to the other pole of said source to cause current flow and set up a jointly induced group of equipotential surfaces around and spaced from said pair of electrodes, thereby creating along the surface of the earth a survey field spaced as a belt from and around said pair of electrodes, said field embracing the traces of said jointly induced equipotential surfaces; and making pick-up observations at spotted points in said field, to obtain desired data. - Claims allowed, 19.

7001. Apparatus for Making Geophysical Explorations; H. M. Evjen, Houston, Tex., assignor to Nordel Corporation, Houston, Tex., a corporation of Delaware: U. S. Patent 2,314,873, issued March 30, 1943.

A system for electrical prospecting, comprising an earth current circuit including a source of direct current, a pair of spaced earth electrodes, and reversing means connected between said source and said electrodes for reversing the direct current at a predetermined controlled frequency whereby an earth current having a predetermined frequency is passed through the earth between said electrodes, a potential circuit including potential pick-up electrodes located at spaced points adjacent the earth's surface lying within the field of influence of said earth current, a direct current indicating device connected to indicate the potential of said potential circuit, and reversing means synchronized with said first reversing means and connected between said potential pick-up electrodes and said indicating device to convert the pick-up potential difference into a uni-directional potential suited to actuate said indicating device, and coupling means connected between said earth current circuit and said potential circuit to impress on said potential circuit a balancing potential which is directly proportional to the current flowing in said earth current circuit at the instant of measurement, said coupling means comprising a resistance connected in series with said earth current circuit to develop a potential drop thereacross proportional to the current flowing in said earth current circuit, a potentiometer connected in said potential circuit to apply thereto a potential drop opposing the potential picked up from said potential pick-up electrodes, a condenser connected across said potentiometer, a second condenser, and synchronized switch means connected to alternately connect said second condenser across said resistance and across said first condenser, whereby said second condenser periodically receives a charge from the potential drop across said resistance and applies the same to said first condenser for thereby building up a charge in said first condenser which is proportional to the potential drop across said resistance. - Claims allowed,

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7002. Magnetic Field Well Logger; Standard Oil Development Co., Linden, N. J., a corporation of Delaware: British Patent 544,676, issued April 23, 1942.

Apparatus for logging the variations of a magnetic field e.g. in a borehole comprising in combination, an indicator adapted to have electric currents induced therein when disposed in a magnetic field, means for moving said inductor over the path to be logged through said magnetic field, and means for collecting and measuring the current induced in said inductor by said magnetic field. - Claims allowed, 7.

7003. Method and Apparatus for Surveying Wells; Mellersh-Jackson, Leonard, of the firm of Haseltine, Lake & Co., chartered patent agents, London: British Patent 546,055, issued July 23, 1942.

A well-surveying instrument comprising a casing and a pendulum within the casing, characterised by the presence in the casing of a record member adapted to be marked by the passage of a current, and means for providing a continuous current flow throughout a prolonged period between the pendulum and record member to mark the latter. - Claims allowed, 11.

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